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Gas Journal

LIGHT - HEAT - POWER - BY-PRODUCTS

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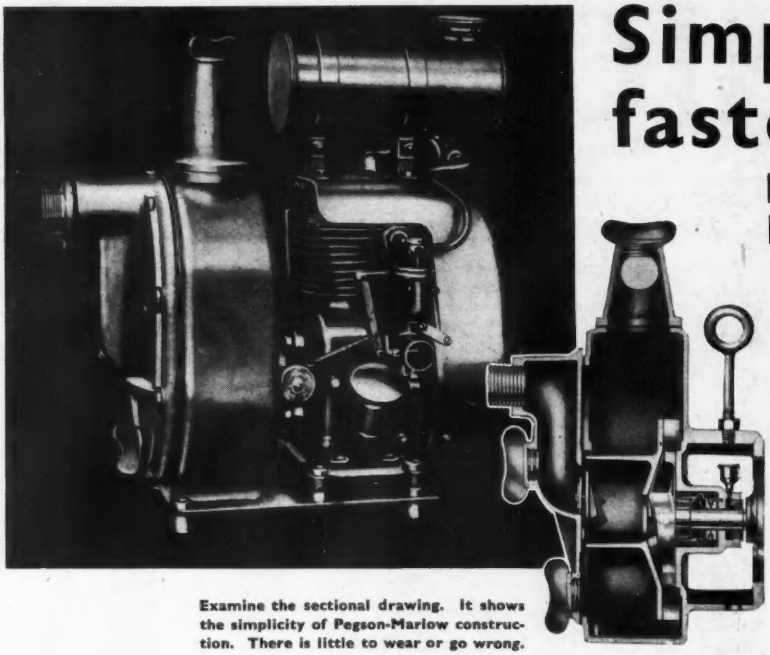

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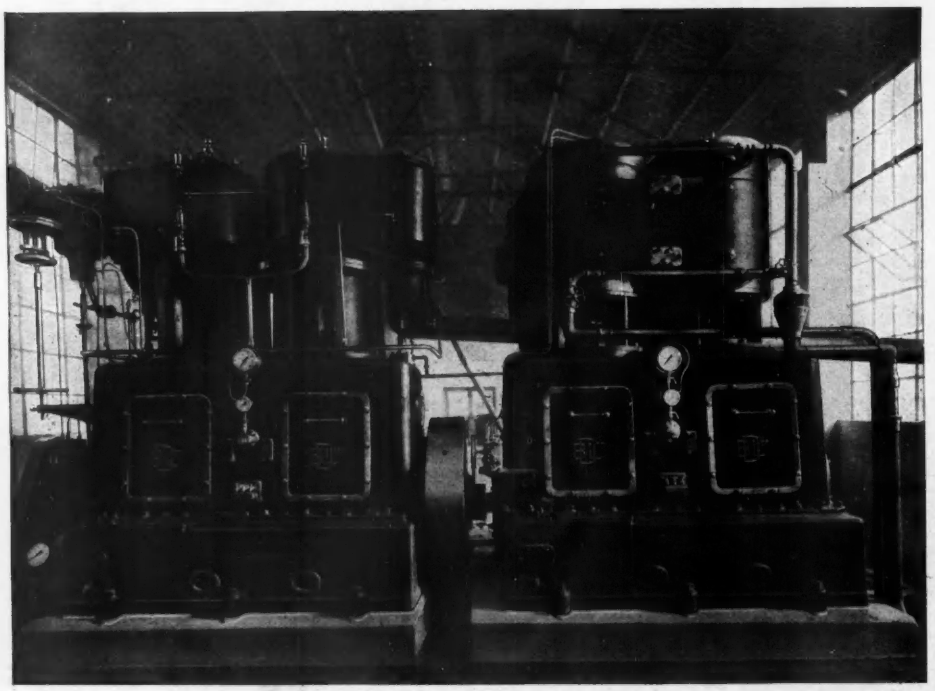

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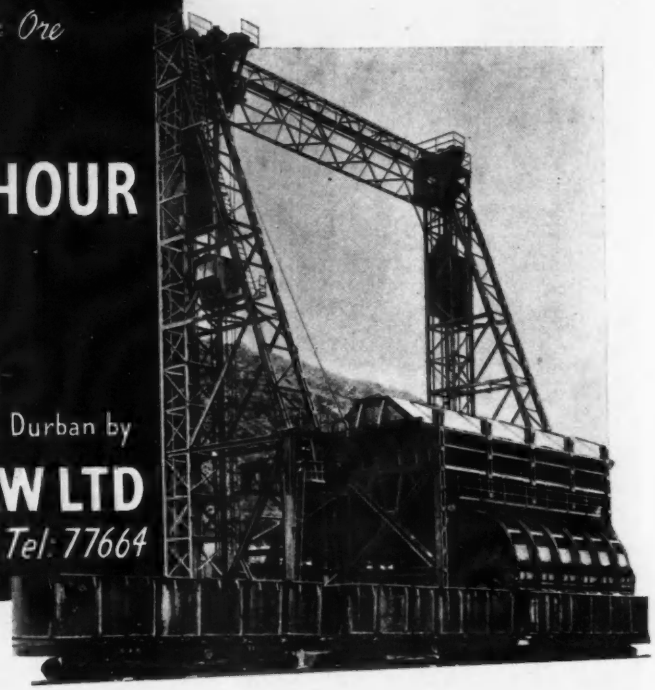

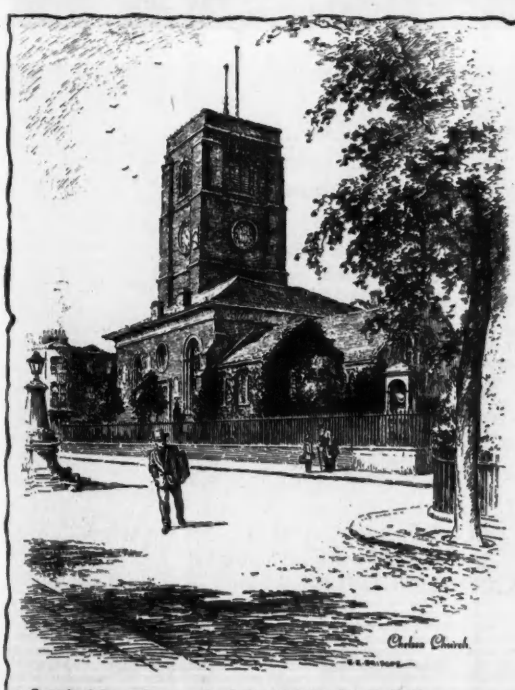

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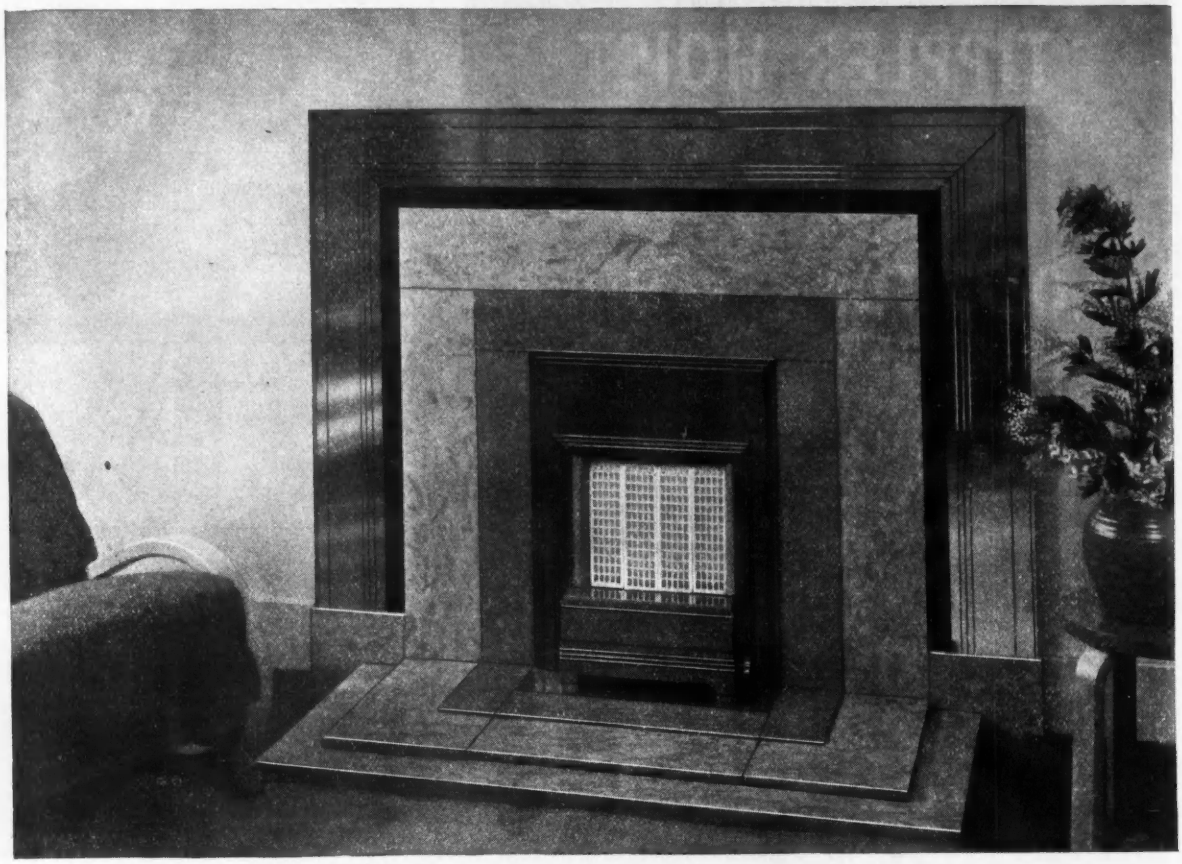

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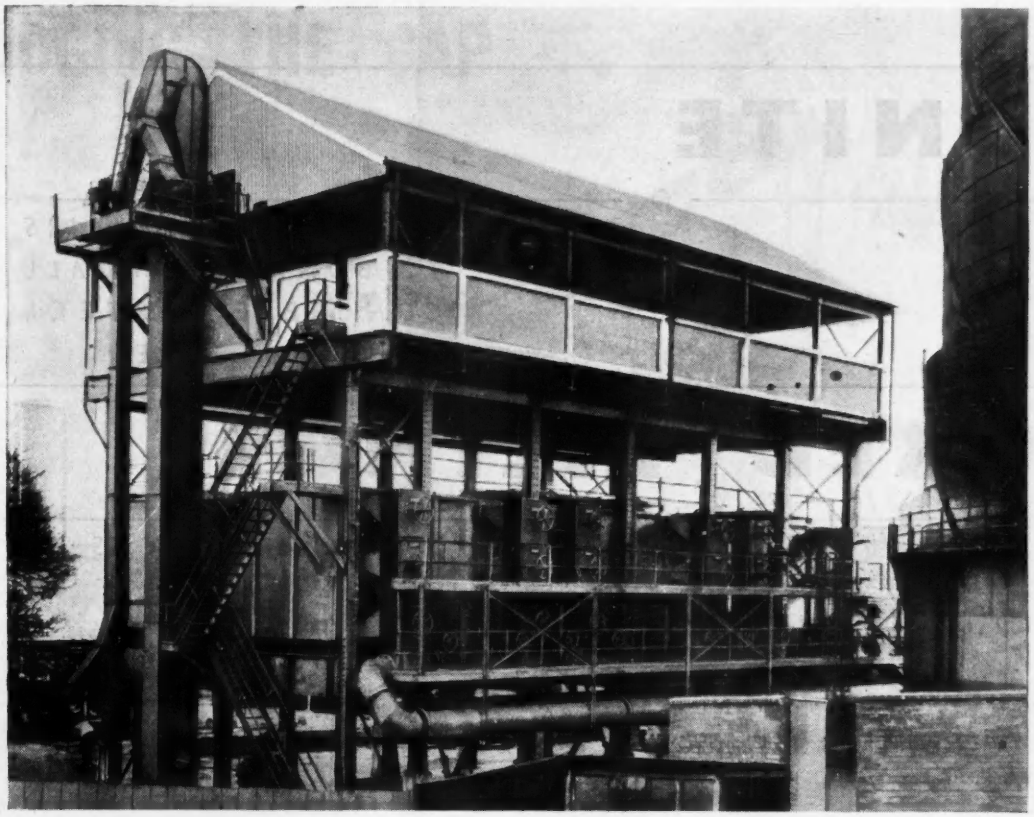

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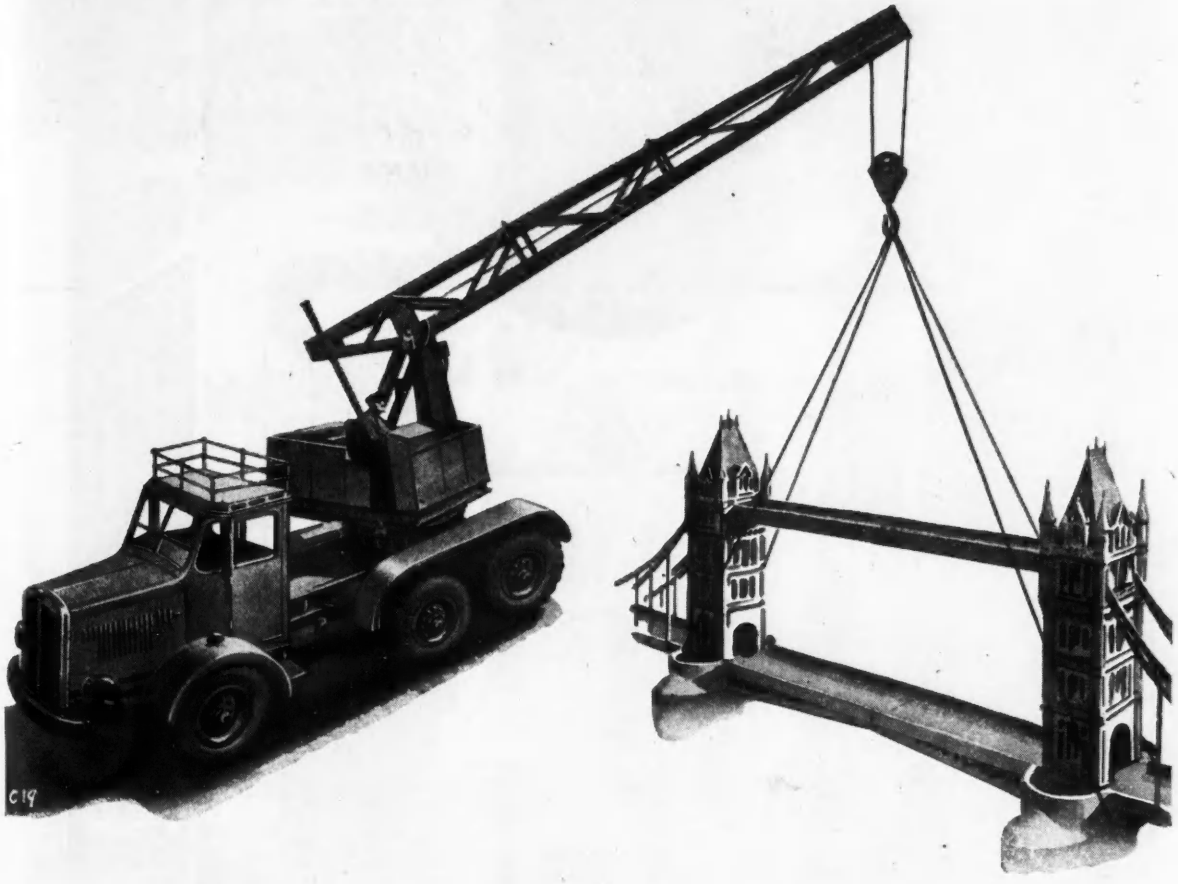

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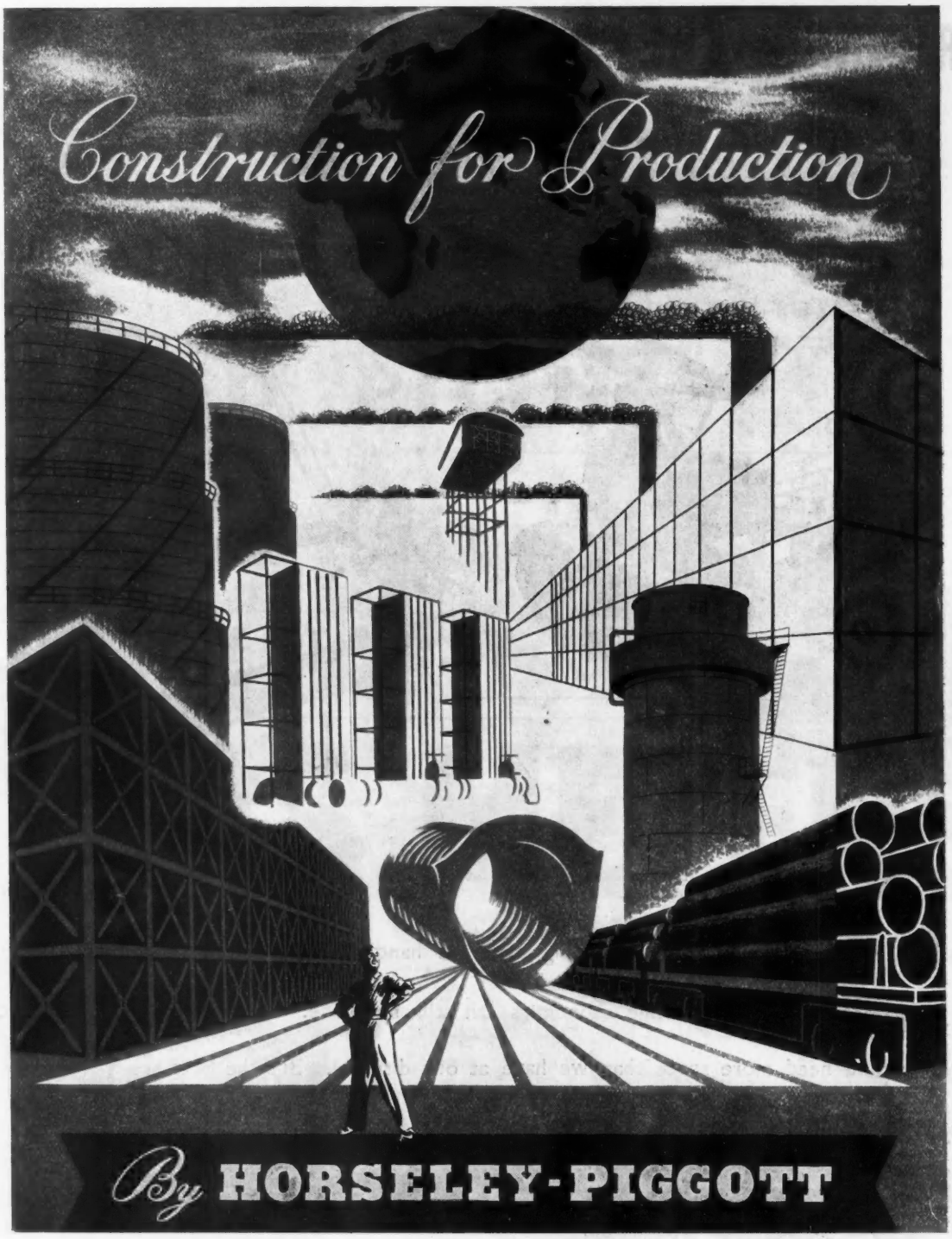

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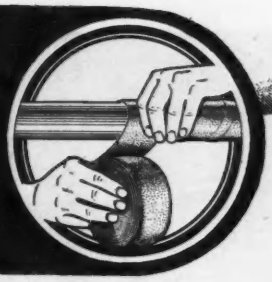

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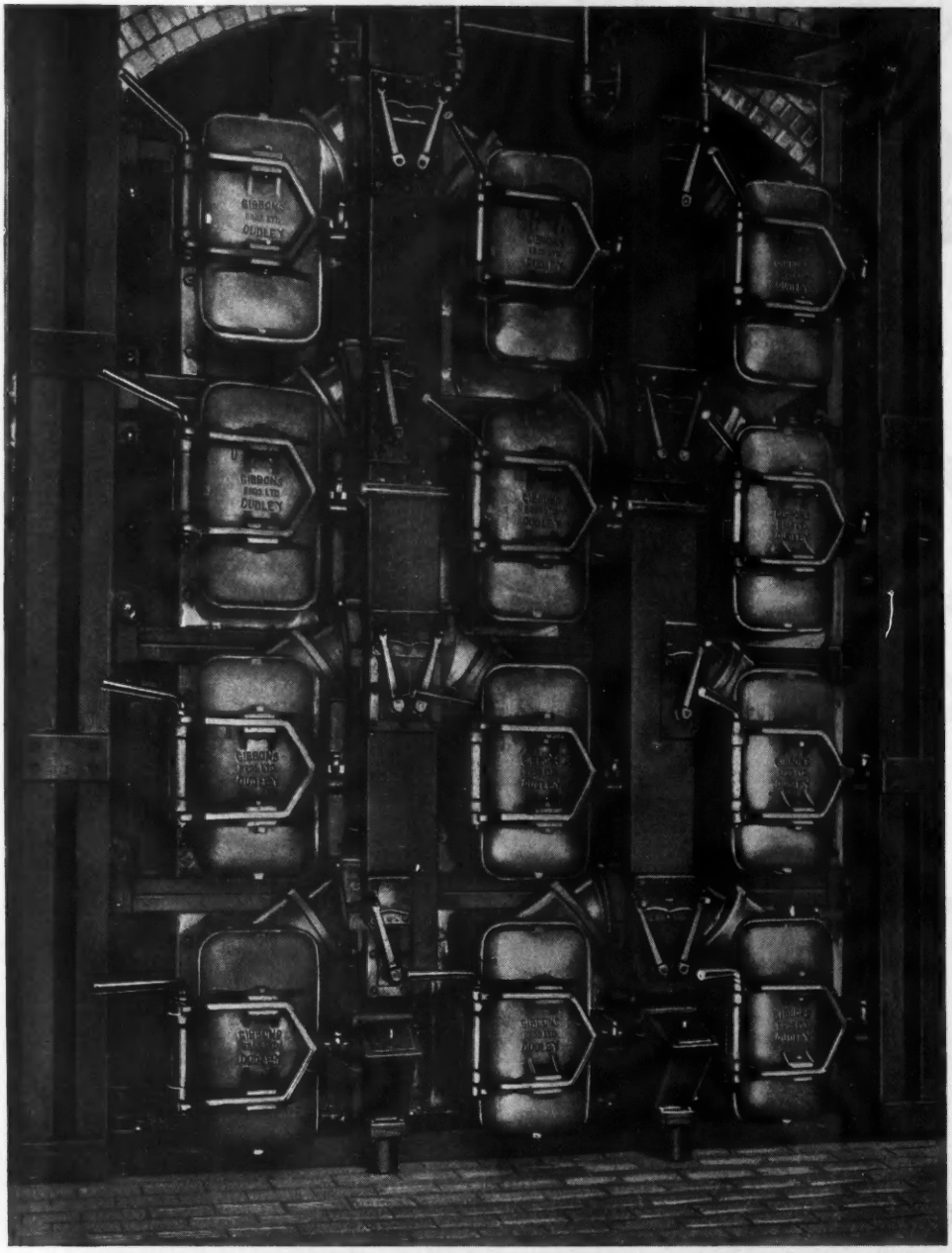

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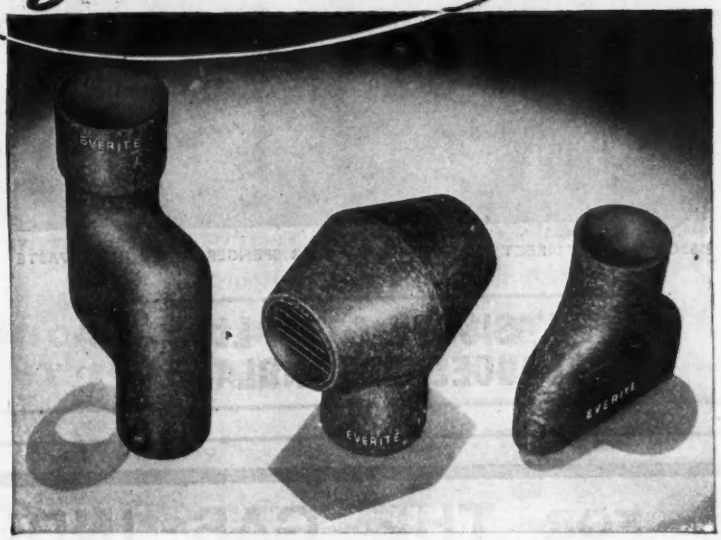

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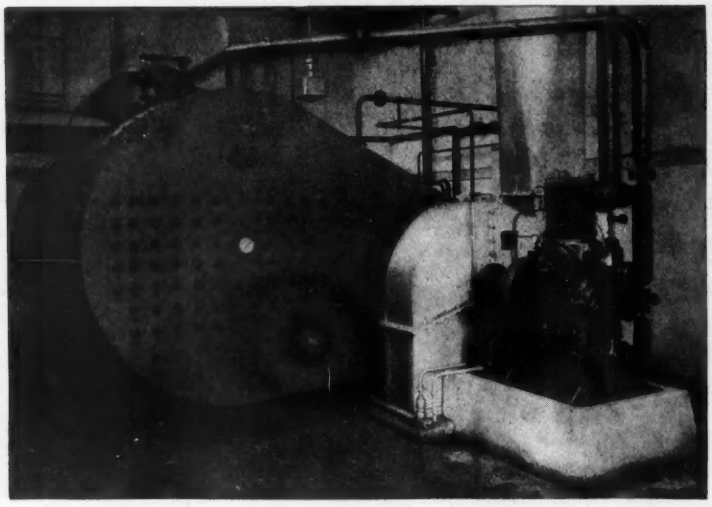

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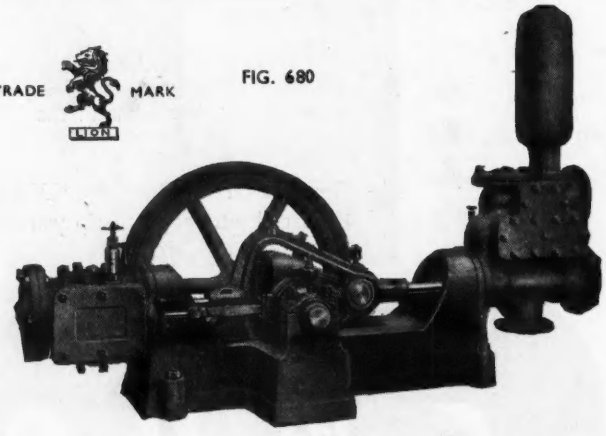

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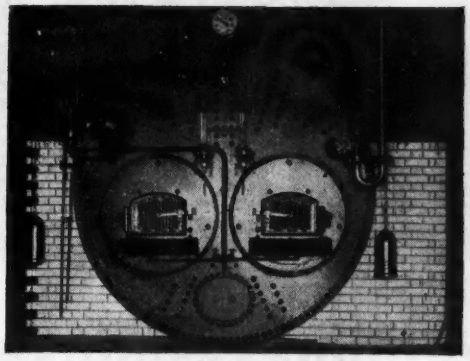

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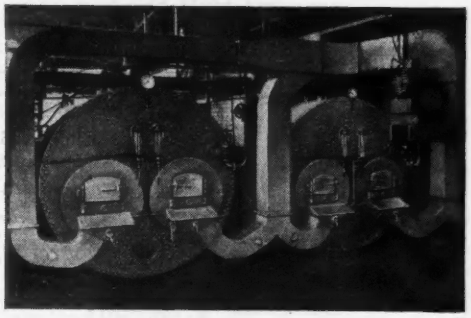

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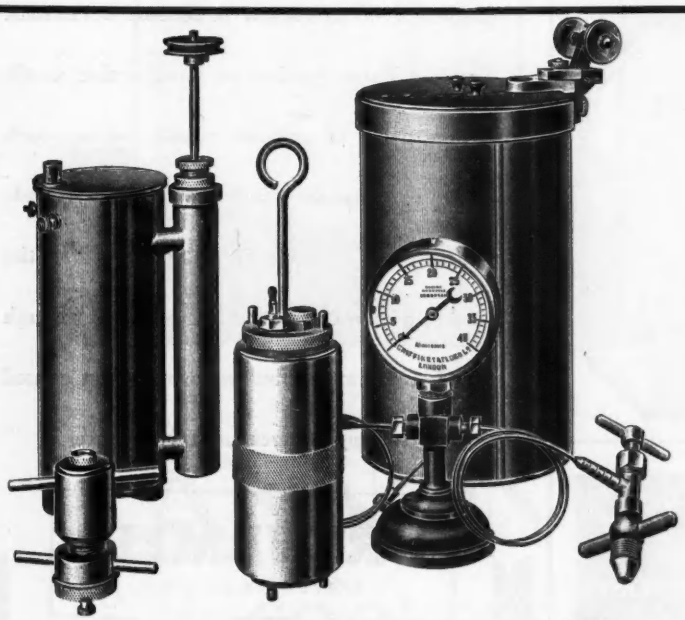

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CONTENTS

EDITORIAL NOTES

Concrete Achievements . . . 121
Hydrogen Production at Gas-Works . 121

Obituary 122
Letter to the Editor 122
Diary 122
Birmingham's Phenomenal Outputs . 122

Five-Year Plan for Steel Industry . 123
Owners Support Coal Policy . . 123
Novel Hydrogen Plant . . . 123
The Production at Gas-Works of Coke for Mobile Gas Producers. By H. D. Greenwood, M.Sc., A.R.I.C., A.M.I.Chem.E., and J. G. King, O.B.E., D.Sc., Ph.D., F.R.I.C. (*continued*) 125

Distillation of Wood in Glover-West Vertical Retorts. By M. P. Blanc 133
Primitiva Gas Company . . . 137
Gas Undertakings' Results . . 137

Gas Products Prices 138
Gas Stocks and Shares . . . 138

THIS WEEK'S ADVERTISERS

	PAGE
Aeraspray Manufacturing Co., Ltd.	S5
Alder & Mackay, Ltd.	S2
Aspinalls (Paints), Ltd.	S4
Bale & Church, Ltd.	139
Blakeley, Firth, Sons & Co., Ltd. ...	139
Bratt Colbran, Ltd.	106
British Thomson-Houston Co., Ltd.	S7
Cannon Iron Foundries, Ltd. ...	117
Cementation Co., Ltd.	108
Chemical Engineering & Wilton's Patent Furnace Co., Ltd. ...	115
Concrete Proofing Co., Ltd. ...	S9
Cowan, W. & B.	Cover III
Crane, Ltd....	116
Crookston, S., & Co., Ltd. ...	S8
Curtis, A. L.	116
Dempster, Robert, & Sons, Ltd. ...	139
Donkin Co., Ltd. (The Bryan)	Cover II
Drakes, Ltd.	S10
Drynamels, Ltd.	116
Electric Construction Co., Ltd. ...	S4
Evans, Joseph, & Sons (Wolverhampton), Ltd.	114
Falk, Stadelmann & Co., Ltd. ...	S7
Filtrators, Ltd.	S5
Gas Meter Co., Ltd.	108
Gas Purification & Chemical Co., Ltd.	Cover I, 139
Gibbons Bros., Ltd.	112
Glover, George, & Co., Ltd. ...	105
Glover, Thos., & Co., Ltd. ...	120
Green & Boulding, Ltd.	139
Griffin & Tatlock, Ltd.	115
Hamilton, Archd. H., & Co., Ltd.	S8
Harrisons (London), Ltd.... ...	139
Holmes, W. C., & Co., Ltd. ...	S1
Horseley Bridge & Thomas Piggott, Ltd.	110
Humphreys & Glasgow, Ltd. ...	118
Jeavons, E. E., & Co., Ltd. ...	116
Keith Blackman, Ltd.	S12
King's Patent Agency, Ltd. ...	139
Kirkham, Hulett & Chandler, Ltd.	S2
Main, R. & A., Ltd.	132
Mewburn, Ellis & Co.	139
New Bowson Coal Co., Ltd. ...	139
Newton Chambers & Co., Ltd. ...	126
North British Rubber Co., Ltd. ...	S3
Parkinson, W., & Co.	120
Peebles & Co., Ltd.	S9
Pegson, Ltd.	Cover II
Pulsometer Engineering Co., Ltd.	Cover IV
Quasi-Arc Co., Ltd. ...	Cover IV
Quickset Water Sealers, Ltd. ...	S4
Radiation, Ltd.	130, 131
Reavell & Co., Ltd.	S8
Siebe, Gorman & Co., Ltd. ...	116
Sisson, W., & Co., Ltd.	114
Slingsby, Walter, & Co., Ltd. ...	S6
Sperryn & Co.	119
Stanton Ironworks, Ltd.... ...	140
Staveley Coal & Iron Co., Ltd. ...	S6
Steels Engineering Products, Ltd.	109
Stein, John G., & Co., Ltd. ...	S11
Strachan & Henshaw, Ltd. ...	105
Sugg, Wm., & Co., Ltd.	135
Technological Institute of Great Britain	139
Thomas & Bishop, Ltd.	138
Trotter, Haines & Corbett, Ltd.	139
Turbine Furnace Co., Ltd. ...	S8
Turners Asbestos Cement Co., Ltd.	113
Underpressure Engineering Co., Ltd.	S8
Walker, C. & W., Ltd.	S11
Walker, James, & Co., Ltd. ...	S12
West's Gas Improvement Co., Ltd.	136
West's Piling & Construction Co., Ltd.	Cover IV
Westwood & Wrights, Ltd. ...	S8
Whessoe Foundry & Engineering Co., Ltd.	107
Winn & Coales, Ltd.	111
Wood, Hugh, & Co., Ltd. ...	129
Trade Cards	138
Appointments Vacant ...	139, 140
Contracts Open	139
Educational	139
Patents	139
Plant, &c.	139
Plant, &c., For Sale and Wanted...	139

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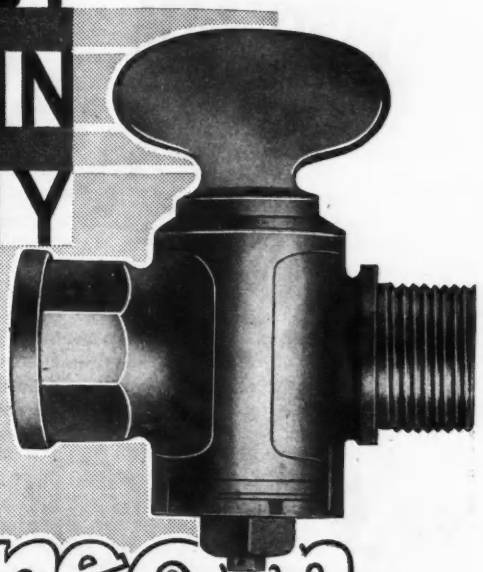

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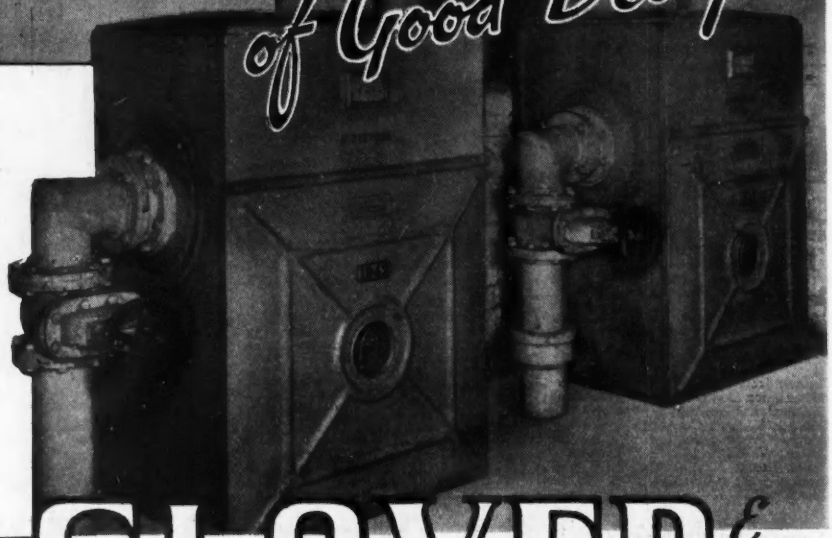

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VOL. 246 97th YEAR No. 4288

EDITORIAL NOTES

CONCRETE ACHIEVEMENTS

DURING recent weeks our pages have recorded the results of the various holding companies in the Gas Industry during the war years, and without entering into any argument concerning the pros and cons of the holding company system as such *vis-à-vis* other forms of integrated working the results to which we refer undoubtedly constitute a series of concrete achievements of no mean order. Throughout at the meetings of the companies the note of optimism has been in evidence. The Heyworth Committee set up by the Ministry of Fuel and Power to enquire into the affairs of the Gas Industry is still sitting and taking evidence; the Association of Gas Corporations has submitted a report, and there are plenty of facts to suggest that the report must have been a strong one. Major schemes of development envisaged await the findings of the Heyworth Committee; for the time being suggested plans are necessarily held in abeyance.

Due to the war there have been very great differences in the vicissitudes of individual undertakings owned by the groups. With bombardment, aerial and otherwise, movement of population, demands of the war industries, and so on the chapters of the composite story vary enormously though the overall general outcome recorded by the various groups is the same—one of very great advance in gas sales. In one of the undertakings of the South-Eastern Gas Corporation, for example, sales in 1941 were 64% less than in 1938. This was a coastal town, and the reduction in output suffered by several other coastal companies was almost as great as this. The Corporation as a whole, however, was able to record in 1944 an output 18% higher than in 1939. Let us glance at a few more results. Compared with the last pre-war year the increase in the Severn Valley group amounts to 78%; in the same period South-Western shows an increase of 57%; the undertakings of Associated Gas and Water Undertakings increased in total annual output from 19 million to 28 million therms; exclusive of the amount sold in bulk by the West Yorkshire Gas Distribution Company, the increase recorded by the United Kingdom Corporation between its formation in 1936 to the year 1944 is 55%.

To what extent all these advances will be maintained in the immediate years ahead remains, of course, to be seen and will be dependent on a multitude of factors and influenced by a line of general policy yet to be defined. Yet, as we have said, the tone of all the meetings of the various groups has been one of optimism which we cannot think is at all misplaced. In many areas there is strong indication that the full wartime requirements will be demanded in the future; there is foundation for the belief that outputs achieved to date can be substantially maintained. In this regard we may refer to the comments of the Chairman of the U.K. Corporation reported in our issue of June 27. Speaking of the industrial load, he mentioned the increase of 235% since the Corporation's formation. Now at least 90% of this increased industrial load has taken place in bakeries, engineering, copper, chemical, glass, and other works existing and operating prior to the war. Survey of the potential loads over the areas supplied by the group indicates that this load will not only be maintained but, in reasonable time, will be doubled. There can be little doubt that during the war years—and, indeed, in the years preceding the war—a very great deal of goodwill has been built up for our product and our service. We think the sky of industrial gas development is very bright.

Then, with the housing programme ahead, the potentialities of gas service in the home are truly enormous; and in this direction, too, we were interested in the Chairman's remarks at the U.K. meeting. The Corporation contemplates the introduction of a simple domestic tariff—a tariff common, it should be noted, to all its subsidiaries. This tariff will provide for a weekly payment of one shilling to meet standing charges, and gas consumed will be charged at one-half the declared price. A further development proposed is the introduction in connexion with new housing estates of a complete fuel service for the home, involving the use of gas and coke for room heating, cooking, domestic hot water, washing, clothes drying, and refrigeration at an inclusive charge, on present values, of from seven shillings to eight shillings and sixpence a week. The broadness of these schemes and their general applicability to all the areas covered appeal to us very much indeed.

HYDROGEN PRODUCTION AT GAS-WORKS

THE supply of hydrogen to the balloon barrage has written another chapter in the history of hydrogen and the Gas Industry. The end gas from the retorts (and sometimes straight coal gas, we believe) was used for inflating balloons in the days when ballooning was the sport of the few intrepid pioneers. There is in Reading Gas-Works, for example, a photograph of a number of balloons at the Works in the summer of 1900 just inflated and ready to take off. On that day, happy augury, a gentleman who was later to become Secretary of State for Air ascended with a lady and proposed to her in mid-air, without upsetting the balloon. For them, aided by gas, the balloon had indeed gone up.

Between 1939 and 1945, again aided by the Gas Industry, many balloons remained afloat to the consternation of the enemy. The proud part played by gas engineers and contractors in making the balloon barrage possible has been recorded in the "JOURNAL" following a visit to Bournemouth; and Mr. Hutchison gave a more detailed account to the Institution last month. To make the balloon barrage the effective defence weapon which it proved, the Gas Industry, without fuss or ado, manufactured hydrogen as such by the steam-iron process—a process which is not so greatly dissimilar from the manufacture of blue water gas as to require a very substantial change in technique. Our Industry is very flexible. Ten years ago, gas engineers might have regarded hydrogen production as a special job almost outside its ambit. To-day, with new processes and new development round the corner, many are not so sure about the advisability of forgetting wartime experience and of speedily dismantling plants. It is more than possible that the experience gained in the war years may prove of immense practical value. Hydrogen is useful for many purposes, and there are uses to which it has not yet been put but which are foreshadowed by the work of the Gas Research Board.

Naturally, the cost of hydrogen production is of primary importance. Mr. Hutchison gave representative figures, but it is difficult to base any criticism on the war costs. Production may not have been continuous, costs may have been inflated for special reasons. The compression costs of 1s. 9d. would not be needed for many uses, or, if needed, they might be more properly charged against the cost of the process that required hydrogen under high pressure. It seems unlikely that many processes will need hydrogen at the high compression required by the balloon barrage. The principal cost was that of the water gas, and consequently of the coke used in the process. That again depends on the price of coal, and presumably some

other methods of producing hydrogen would suffer from the same drawback. To-day the cheapest hydrogen is made by the water gas catalytic process which is used for the production of by far the largest proportion of the world's output of synthetic ammonia. Water gas, containing approximately equal proportions of carbon monoxide and hydrogen, is passed with steam over a catalyst at 450°–600°C. forming carbon dioxide and hydrogen. The gas then contains two volumes of hydrogen to one of carbon dioxide and 2–4% of carbon monoxide. It can be purified from carbon dioxide and carbon monoxide, and is then virtually free from more than small quantities of diluents. Taking cost, size of units, and other factors into account, it would appear that the steam-iron process used by the Gas Industry does not produce the cheapest hydrogen, and it is doubtful if the present small units could be kept in commission on economic grounds alone.

Electrolytic hydrogen is the purest form of the gas; the chief cost is that of the current, and the consumption amounts to some 6 units of electricity for a 2.5 volt cell per cubic metre of hydrogen at N.T.P. For a 2.5 volt cell, therefore, the consumption is 160 units per 1,000 cu.ft. of hydrogen at S.T.P.; for a 2-volt cell it is 130 units. With current charged at 1d. a unit, as in Mr. Hutchison's Paper, the cost would be very much greater than by the steam-iron process. With current at off-peak prices, which may be as low as 0.25d. per unit, or generated from high pressure steam used afterwards for process work, which is likely to be at an equally low price, the electrolytic process might begin to compete with the steam-iron process. Since the hydrogen manufactured by the Gas Industry is neither particularly pure nor particularly cheap, it hardly seems likely that these plants will supply hydrogen for welding and similar purposes to industry. It is true that hydrogen would be a by-product from coke, and since we use coke to produce water gas, there would seem no valid reason why we should not go a stage further and use the water gas to produce hydrogen for sale, if it turns out that there is a market for it. But the chances seem unfavourable. For industrial use in processes such as hydrogenation hydrogen would probably require to be made virtually on site. The availability of cheap hydrogen near the gas-works might be an inducement to situate chemical and similar works in a particular locality. That is a business opening which requires to be explored in concert with such bodies as the Association of British Chemical Manufacturers. But again the cost of the hydrogen may be against this.

Some years ago the Fuel Research Board worked out a process of continuous hydrogenation of tars at moderate pressures and on quite a moderate scale. The need for motor spirit might encourage the Gas Industry to look into this possibility, especially on the larger works. It may be suggested that the crude tar would be distilled to recover the more valuable constituents, following which the residue would be converted into light spirit *via* the continuous hydrogenation plant. The gases issuing from this plant would be at high pressure, and could be added to the gas going out to the district, thereby raising its pressure when needed without the necessity for compression. That proposal was put forward as long ago as 1936, but does not seem to have been taken up seriously, possibly because the suggestion was then to use the end gases from carbonization as the source of hydrogen. As against this proposal, there is the fact that Imperial Chemical Industries have already in existence plant large enough to hydrogenate the bulk of the creosote available in this country. Hydrogenation is a specialized technique in which I.C.I. have a long lead. Is it a suitable technique to be undertaken by the Gas Industry? The small size of the hydrogen plants and the small scale of the hydrogenation would increase costs above those which are economic. If anything is to be done, it may well be suggested that the working up of tar products should be left to the tar distiller. The carbonizing industries, the tar distillers, the producers and sellers of coke—all should work together in co-operation. But there would be then no demand for the hydrogen from the Gas Industry.

The work of the Gas Research Board opens up a wide field for possible utilization of hydrogen. The gasification of coal in hydrogen under pressure is the most obvious process for which hydrogen may be used in quantity; the use of the Bournemouth plant for the experimental work is common knowledge, and the Gas Industry is fortunate in having that plant at its disposal at a time when it is most needed. Whether hydrogen will be required for this purpose depends upon the success of the work now being undertaken. It would seem unlikely, however, that all the work on which the Gas Research Board is and has been engaged for so long will have a purely negative outcome.

While we can foresee the manufacture of hydrogen by the Gas Industry at a future date, we cannot see any immediate use for the hydrogen plants built at gas-works to provide gas for the balloon barrage. It seems to us that the scale is too small for low costs and that the process is inherently more costly to operate than other processes. In saying which we would add that the experience of hydrogen production gained by the Gas Industry should prove of very great value.

Obituary

The death occurred at Bradford on July 14 of Mr. E. G. GILLETT, one of the first members and a Past-President of the Yorkshire Junior Gas Association. He retired six years ago from the post of Works Superintendent at the Birkshall works of the Bradford Gas Department.

Letter to the Editor

Oil Production or Gas Production?

DEAR SIR,—May I congratulate you on your recent Editorial on Mr. T. Biddulph-Smith's criticism of the carbonizing industries, and may I add that I can perhaps claim a right to refer to the question of oil from coal since I have been for many years an advocate of hydrogenation by the I.C.I. modification of the Bergius process, in which 160 gall. of petrol per ton of coal can be produced (*vide* my letter to *The Times* of Aug. 15, 1933, reproduced in the next issue of the "GAS JOURNAL").

The Gas Industry has a well-deserved reputation for efficiency in the production and distribution of gas, while the by-product coking industry efficiently produces an indispensable commodity in metallurgical coke, as was emphasized by Mr. Norman Dawson as long ago as 1927 in a written discussion printed on my paper in *J.S.C.I.*, Jan. 14, 1927, pp. 1T–20T.

May I suggest that those who wish, like Mr. Biddulph-Smith, to aim at maximum oil yields in carbonization alone are following a will-o'-the-wisp?

31, *Stanhope Gardens*,
South Kensington, S.W. 7.
July 22, 1945.

Yours faithfully,
LAURENCE H. SENSICLE, B.Sc., F.R.I.C.

Diary

Aug. 2.—Institution of Gas Engineers: Gas Education Committee, 2 p.m., Gas Industry House.
Sept. 7.—North British Association of Gas Managers: Annual Meeting, Glasgow.

Birmingham's Phenomenal Outputs

Presenting the annual report of the Birmingham Gas Department to the City Council, Councillor J. C. Burman, Chairman of the Committee, expressed high appreciation of the distinguished service which Mr. A. W. Smith, who recently retired from the position of General Manager and Secretary, had rendered to the undertaking. Only those who had known him for a considerable time realized the great work he had performed in administering the Department for so long a period, and the respect and regard in which he was universally held in the Gas Industry. He had been succeeded by Mr. A. W. Lee, for many years Assistant Manager and Secretary, and the Committee was confident that the undertaking would continue to advance under his direction.

The Department, which would attain its 70th birthday this year, had shown phenomenal outputs of gas during the past seven years, and it was significant that some 46% of the total gas sent out from the gas-works had been used for industrial purposes. In the period indicated the undertaking had played an essential and significant part on the home front.

The general scale of gas charges had been advanced by 0.75d. per therm, but he reminded the Council that the price of gas had only been advanced on three occasions in the past seven years, and the present prices compared very favourably with those of other large undertakings. The highest price in the scale to-day was 4s. 4.25d. per thousand cu. ft., compared with 3s. at the end of hostilities in 1918. By 1921, however, the price had risen by six stages to 5s. 6d., so that to-day's price was over a shilling less than in 1921.

Five-Year Plan for Steel Industry

A five-year plan for the modernization and reconstruction of the British steel industry, involving a total expenditure of £120,000,000, has been announced by Sir John Duncanson, who recently relinquished the post of Controller or Iron and Steel to become Commercial and Technical Director of the reconstituted British Iron and Steel Federation. A considerable part of the plan has been approved and work on some of it has already commenced. Plans are being studied for the construction of new coke ovens to produce 2,500,000 tons of coke for the use of steel works (£6,500,000), 19 new blast furnaces (£19,000,000), new melting shops (£20,000,000), replacement and reconstruction of rolling mills and new continuous hot strip mills in South Wales (£33,000,000), and ancillary processes (£16,000,000 to £19,000,000).

In addition, a further ten blast furnaces are contemplated to replace existing furnaces as these go out. As there are at present 98 blast furnaces working in Great Britain, it will be seen that nearly one-third of these are to be rebuilt or replaced. Each of the new furnaces will be of the latest type.

"Given adequate building labour and reasonable priority on materials," says Sir John Duncanson, "the bulk of the work should be completed within five years. By that time modernization of plant throughout the country will have been achieved. Apart from increased efficiency, the most important result of this will be that the capacity for total steel ingot production in Great Britain will be increased by approximately 20%. As no two iron and steel plants can be entirely alike, costs of construction will vary. Detailed examination of each project is necessary as the laying down of new plant or the reconstruction of existing works has to be carefully planned to meet differing conditions.

"With over-riding priority being given to building labour for house construction, progress on the modernization plans will, of necessity, be slow at first. Work has already commenced on the rebuilding of four blast furnaces, and replacement of coke ovens, in Scotland and on the North-East coast. In the Midlands, an expansion of open hearth capacity is now under way, which, when completed, will be capable of producing an additional 100,000 tons a year of special tube steel. The construction of new plant for the production of the latest type of hot rolled sections for window casements for the housing programme has begun at Darlington, with new sectional mills for the rolling of light sections for the construction of buildings.

"New reversing slabbing mills, cogging mills and wide sheet cold reduction mills to supply sheets required by motor car manufacturers, unloading and ore handling plants to enable larger iron ore ships to be used in the carriage of foreign ore, gasholders and pipe lines so that blast furnace gas can be harnessed and re-used as industrial gas and extensions to the heavy plant engineering capacity to provide for new steelworks extensions; all these are in course of construction.

"Ore crushing, sintering and screening plant to reduce the amount of coke per ton of pig iron made is being installed at a number of works and the complete mechanization of 28 iron foundries to meet the demand for baths, sinks, kitchen units and other household equipment has commenced. Although there are many hundreds of iron foundries in the country, these 28 works, when completely mechanized, will be capable of producing more than 50% of the total output of iron castings.

"Ninety per cent. of the new plant and equipment created during the war is of little or no post-war benefit, as this was undertaken to increase direct armament supply. In all, the iron and steel industry produced and handled a grand total of 86,000,000 tons of steel during the European war; of this, 14,000,000 were imported, and the rest manufactured at home. During this period, the industry mined and used over 100,000,000 tons of iron ore and approximately 5,000,000 tons of scrap was obtained from three great scrap collections—the National Survey, which produced 3,500,000 tons, steel scrap recovered from "blitzed" buildings, which provided approximately 600,000 tons, and railings, which also amounted to about 600,000 tons.

"The iron and steel industry in Great Britain is not resting on past accomplishments. Moreover, to-day international exchange of information between the various iron and steel industries of the world is such that all are kept fully informed of the latest developments in any country."

The Institute of Physics announces that from July 31 its address will be 19, Albemarle Street, London, W. 1 (Telephone: Regent 3541).

The Wartime Office of Messrs. W. C. Holmes & Co., Ltd., at 19, Surbiton Hill Park, Surbiton, will be closed on July 30, and all business will be dealt with at the Company's former offices at 119, Victoria Street, London, S.W. 1 (Telephone: Victoria 9971/3).

Gas Consumers at Dunfermline are to receive a 25% rebate on their accounts for the quarter ended May, 1945. The Convener of the Gas Committee has reported a surplus of £8,000, due to largely increased consumption and to technical improvements and economies which have allowed for a greater output of gas per ton of coal carbonized. The rebate will absorb £7,000.

Owners Support Coal Policy

The Mining Association has accepted the Government plan for the coal industry and has promised to do all in its power to make it effective. In making this announcement Mr. Robert Foot, Chairman, states that in addition to the two members of the Reid Committee serving on the Technical Survey Committee two others have promised full support and will be available for special consultation as necessary.

The Technical Survey Committee will proceed immediately with arrangements for a detailed technical survey of the industry, bearing in mind that it is the policy of the industry to ensure that all technical impediments to achieving maximum efficiency in mining operations are removed.

The Government plan contemplates that the working, treatment, and disposal of coal should continue to be conducted by private enterprise, provided these are planned in accordance with the national need and conducted with the maximum efficiency. The making and carrying out of the plans for securing the proper development and efficient conduct of operations in each coalfield according to the best modern practice should be undertaken by the industry itself. In so far as the grouping or amalgamation of collieries is necessary for this object it should be carried through voluntarily if possible, but otherwise by compulsion. Amalgamation for amalgamation's sake is not proposed, for in this diversified industry where conditions vary widely there are often to be found highly efficient undertakings which are sometimes not large, and in such cases amalgamation would only be proposed if there were clear advantages to the nation and the industry.

It is proposed that a central authority appointed by the Ministry of Fuel and Power and subject to his general direction should be set up with the duty of satisfying itself that the scope and effect of the plans conform to national requirements, having powers of enforcement in reserve and having the necessary sanctions for making sure that the essential improvements recommended in the Reid report are carried through.

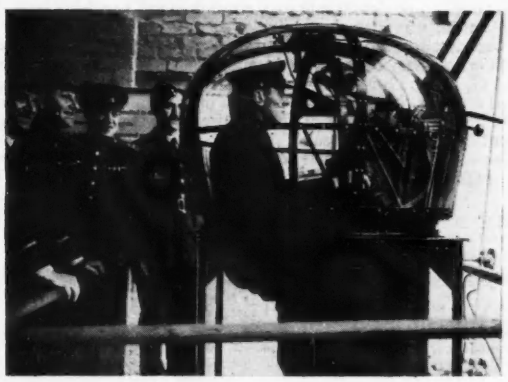
The structure to be established within the industry will now be worked out in relation to the Government proposal for the setting up of a statutory authority, taking fully into regard the Foot plan.

Novel Hydrogen Plant

The Indian State of Travancore recently contracted with an American Company for the supply of plant to make synthetic ammonia fertilizer. Travancore is deficient in coal and coke, though the State contains large areas of forest country, from which ample supplies of timber can be made available.

After considerable investigation in the United States, the American engineers acting for the State of Travancore have selected processes of the Power-Gas Corporation, Ltd., Stockton-on-Tees, to produce the required mixture of hydrogen and nitrogen for the production of ammonia. The system of making hydrogen will be entirely original to the ammonia industry, starting with the cheaply available wood. The capacity of hydrogen to be produced will approach the total of all the many plants in Great Britain, where hydrogen has been manufactured for balloon barrage purposes. Nitrogen will be obtained conveniently from the waste gases, and the mixture will be purified at pressures up to 2,000 lb. per sq.in., to the fine limits required before the hydrogen and nitrogen are suitable to combine in producing ammonia.

The Power-Gas Corporation has been closely associated with the development of hydrogen plants, since it constructed the first shaft-type generator installation for balloon barrage use operating according to the steam-iron process, at Bournemouth in 1940, and it is this same process which has been further adapted.



Now that the "veil of secrecy" has been lifted we have a glimpse of the gas water heater manufacturing industry's contribution to the war effort. This photograph, taken recently at Britain's Aircraft Exhibition in Oxford Street, London, shows a member of the Soviet Military Mission at the controls of a hydraulically operated turret manufactured by Ascot Gas Water Heaters, Ltd.

The Production at Gas-Works of Coke for Mobile Gas Producers*

Part I.—Factors Affecting the Manufacture of Reactive Coke at Gas-Works

By H. D. GREENWOOD, M.Sc., A.R.I.C., A.M.I.Chem. E., and
J. G. KING, O.B.E., D.Sc., Ph.D., F.R.I.C., Director, Gas Research Board

(*Continued from p.* 98)

The C.A.B. values of the cokes ranged at first from 0.035 to 0.064, but it was found preferable to aim at a value of 0.40 in order to prevent any part of the product from being made of too low a reactivity. The data given in the third column of Table II may be regarded as typical of the yields obtainable from a clean, graded Nottinghamshire coal.

TABLE II.—Results of Coke Manufacture at Birmingham.

C.A.B. value of fuel	0.400	0.051	0.048 (normal conditions)
Tons per day	6.7	6.09	6.73
Therms per ton	78.5	75.3	82.9
Therms per retort per day	520.7	458	557
Coke, per cent. of coal	55.8	—	55.4
Gas, calorific value	483	476	481
Steam, per cent.	13.8	7.3	13.7
Temperature of carbonization, °C.	1,325 1,052	1,352 1,041	1,335 1,070

The coke prepared was tested in the modified producer and gave satisfactory results. Typical operating results are given in Table IX.

Organization of Large-Scale Production of Reactive Coke.

In view of the satisfactory results obtained from the use of cokes with C.A.B. values between 0.04 and 0.05, made at Edinburgh and Birmingham, it was decided on the recommendation of the Chemical Advisory Committee of the Ministry of War Transport that some 1,000 vehicles should operate on high-temperature coke in place of anthracite, using the modified producer, and that this coke should be made at three Gas-Works, to be suggested by The Institution of Gas Engineers. It was intended that this scheme should provide practical experience in the manufacture of such special cokes, and would further provide an opportunity for organizing a distribution scheme similar to that set up for anthracite. For this purpose 40,000 to 50,000 tons of suitable coal were to be allocated by the Ministry of Fuel and Power. Since the whole of the anthracite used for gas producers is obtained from South Wales it was decided to limit the production and use of coke to the Midlands and North. Works were therefore selected in these areas where suitable coals were already being carbonized, and where separate screening plant could be installed without unduly disturbing the existing plant. Of the works having previous experience of the carbonization of suitable coals, Bradford and Liverpool were selected as production centres; for various reasons Birmingham, Newcastle and Edinburgh were unsuitable for the limited production of coke required. At Rochdale two settings of retorts were being retained under heat by the Ministry of Supply for a special purpose, and it was decided that these should be used temporarily for producer coke manufacture, since separate screening plant, requiring only slight modification, was already available.

It has already been stated that in order to obtain suitably reactive coke it is necessary to select coals whose caking power ranges between C and G_2 in the Gray-King assay scale. In addition to this, the size of coal must be chosen to give uniform operation of the retorts and to give a high yield of coke of the required size, thereby reducing the amount of crushing necessary.

The properties of the coals used in the production of test cokes are given in Table III.

TABLE III.—Properties of Coals Used for Large-Scale Production of Producer Fuel.

Coal	I	J	F	H	A
	2	3	4	5	6
Moisture, per cent.	7.4	6.1	6.1	5.2	8.8
Volatile matter, dry, ash-free basis, per cent.	40.5	38.7	40.3	41.3	42.1
Ash content, per cent.	5.0	2.6	5.3	3.6	2.2
Gray-King Assay type	E/F	DG	EG	EF	D

Production at Rochdale.

The plant at Rochdale consisted of two settings of Glover-West retorts, both of which had been kept on slow heating for the Ministry of Supply. The results given in this Paper were all obtained in two retorts in one of the above settings. Considerable difficulties were experienced during the experiments in obtaining adequate temperature control, due in part to leaky brickwork.

The coke from the retort was taken by bucket conveyor to the screening plant. The coke was fed directly to the P.S.C. crusher, from which it passed through screens of 1 in. and ¼ in. aperture respectively, the fraction between these two sizes being collected as producer fuel.

In order to conform to the very strict specification for tar content, it was essential that the rates of coal feed and coke extraction should be maintained as uniform as possible and, in addition, that periodical tests should be made on the coke. Representative samples of coke were therefore taken from each day's make, and these were tested for ash content, C.A.B. value, and potential tar. From the tests with coal F, spot samples of coke were taken from individual draws, and these were tested for C.A.B. value and potential tar.

The results are collected in Table IV, and show that coke with a C.A.B. value of 0.04 was produced by carbonizing at temperatures about 50°C. below that of normal gas-works practice. Compared with the results obtained with coal J, which was one of the coals normally used at Rochdale, there was a reduction in yield of gas in therms per ton of 12.2, but the yield in therms per retort was actually increased owing to higher throughput of coal. This loss of yield is high when compared with the Birmingham figures for coal F, which indicate that coke with a C.A.B. value of 0.04 can be made with a loss of thermal yield of gas of about 5.0, and that when the C.A.B. value is raised to 0.05 and the normal carbonizing temperatures employed, there is no reduction in gaseous thermal yield below that of normal working. Further, since it is generally desirable to increase the throughput, the output in therms per retort may even be slightly increased.

The characteristics of the coke produced at Rochdale are given in Table V. No difficulty was experienced in maintaining uniform coke quality once the conditions had been established. In the course of the tests there were two instances of uneven travel of the charge and some incompletely carbonized coke was produced, but this was seen and quickly remedied. The size of the cokes and properties of the fuel made varied over comparatively narrow limits : the proportion of coke over 1 in. varied only from 65 to 70%. It was found that it was unnecessary to "scalp" the coke before crushing, since the mean ash content of the material over ¼ in. was sufficiently low.

The uniformity of production is illustrated by the following figures for tar content and C.A.B. value, which show that it is possible, with reasonable care, to manufacture fuel within the specification limits.

Coke.	No. of Samples.	C.A.B. Value. Maximum.	Minimum.	Average.	Potential Tar, oz. per ton. Maximum.	Minimum.	Average.
1	2	3	4	5	6	7	8
Coal I (*a*)	12	0.039	0.031	0.034	9	2	5
Coal I (*b*)	14	0.045	0.031	0.041	6	2	4
Coal J	7	0.046	0.026	0.034	14	10	10

It is interesting to record, however, that there were quite considerable variations in the ash contents and C.A.B. values of the different sizes of coke as manufactured.

Coal	I	F	J
Ash, per cent.:			
Under ¼ in.	12.0	13.0	—
¼ to 1 in.	8.9	8.0	—
Over 1 in.	5.7	6.0	—
C.A.B. value:			
¼ to 1 in.	0.031	—	0.034
Over 1 in.	0.040	—	0.065

The figures show appreciable reduction of ash content in the fuel by removal of the fines below ¼ in. Also, the difference in C.A.B. value between coal I and coal J is accounted for by the higher rank of coal J.

Production at Bradford.

Earlier experiments had been carried out at Bradford for the Gas Research Board, using coal H, and for the purpose of comparison both sets of results are included in Table IV.

* From Communication No. 281 of The Institution of Gas Engineers' Annual Meeting, June 12–13.

TABLE IV.—Carbonizing Results in Continuous-Vertical Retorts.

Works	Rochdale. Glover-West.					Birmingham. Woodall-Duckham (upwardly heated).	Bradford. Woodall-Duckham (upwardly heated).	Bradford. Woodall-Duckham (downwardly heated).	Edinburgh. Woodall-Duckham (downwardly heated).
Diameter of Major Axis, in. ...			33			62	61⅛	57⅛	76
1	2	3	4	5	6	7	8	9	
Coal (see Appendix)	I	I	J	F	F	H	H	A	
Period of test, hr.	124	98	72	72	—	—	—	—	
Coal, tons per retort per day ...	3.8	4.5	3.4	4.35	6.7	7.25	5.33	8	
Gas, therms per retort per day ...	259	346	301	326	520.7	477	360	646	
Gas, therms per ton	68.2	76.8	88.6	72.9	78.5	65.80	67.45	76	
Gas, calorific value, B.Th.U. ...	471	480	479	463	483	519	491	476	
Coke, per cent. of coal	55.9	59.0	58.5	56.7	55.8	—	60.0	56	
Coke, C.A.B. value	0.034	0.040	0.058	0.040	0.040	0.035-0.040	0.04-0.045	0.042	
Temperature, top of retort, °C. ...	1,040	1,075	1,160	—	1,325	970	1,275	1,340	
Temperature, bottom of retort, °C. ...	1,160	1,215	1,230	—	1,052	1,255	1,105	1,110	
Steam, per cent. of coal	7.2	7.8	9.4	11.85	13.8	17.0	14.0	19	

TABLE V.—Analysis of Cokes over ¼ in.

Coal (see Appendix)	I (1)	I (2)	I (3)	J	F	H (a)	H (b)	A
1	2	3	4	5	6	7	8	9
Moisture, per cent.	1.4	1.8	2.2	2.0	2.0	—	1.0	5.3
Volatile matter, per cent.	1.0	1.1	1.2	1.2	1.4	5.3	2.5	2.0
Ash, per cent.	6.4	6.4	6.1	5.4	6.4	5.7	7.0	4.7
C.A.B. value	0.034	0.041	0.039	0.058	0.040	0.035-0.04	0.04-0.045	0.042
Potential tar, oz. per ton	5.0	4.0	8.0	12.0	12.0	1-4	10.0	3.5
Screen analysis:								
Over 1 in.	67	64	77	68.2	75	72	69	—
¼ to 1 in.	23	25	10	19.3	19	19	27	—
Under 1 in.	10	10	13	12.5	6	9	4	—
Bulk density, lb. per cu.ft.	—	—	21.7	—	17.1	—	21.9	28.0

In 1940, Woodall-Duckham retorts of 61⅛ in. major axis, upwardly-heated, had been used, whereas in 1943 downwardly-heated retorts of 57⅛ in. major axis were employed. In each case two retorts were used, the gas off-takes being connected to the test plant for purification and measurement. The upwardly-heated retort was part of a bench of thirty, each retort offtake delivering into a common collecting main, whereas the two downwardly-heated retorts were part of a bench of twenty, each bed having its own sealpot and ascension pipe. Since no separate screening plant was available, the coke was treated by hand.

The carbonizing conditions and yields are given in Table IV and the coke characteristics in Table V. The two sets of results are not directly comparable, since the coals were carbonized in different types of retorts, but they indicate that coke with a C.A.B. value of 0.04 to 0.045 could be made with little sacrifice in gas yield.

The coke sizes were similar to those obtained with the other coals at Rochdale and Birmingham.

Coke Crushing and Grading.

The results given in Table V show that over 70% of the coke made from the selected coals was larger than 1 in. in size, and that crushing and regrading would therefore be necessary. It was obviously of importance that the crushing in particular should be done with a machine and by a procedure which would cause the minimum wastage as fines. Three types of crusher were selected as likely to give high yields, and these were subjected to trial with a number of samples of coke. In making the trials it was arranged to leave in the finished grade a small proportion of over-size, in order to reduce crushing losses, and it was hoped to find a crusher in which it would not be necessary to recirculate the over-size in order to obtain a high yield.

The types of crusher tested were:

A. Single-roll breaker, consisting of a 15-in. by 15-in. roller in conjunction with a stationary breaker-plate. The roller has a uniformly segmented surface, and in addition parrot-beak breaking segments which fit into corresponding grooves in the breaker-plate.

B. Single-roll breaker, consisting of 36 sections of 1-in. width and outer diameter (to edge of teeth) 21 in., in conjunction with a stationary and adjustable cutting plate. Each roller incorporates 33 teeth of parrot-beak form, of 1 in. thickness at the base, tapering to a point, and of ¾ in. effective depth, with a 2-in. staggered spacing at the points. The cutting plate is serrated to fit.

C. Double-roll breaker, consisting of two shafts each carrying 10 rings of width 1½ in., with 14 prickers or teeth on each ring. The shafts revolve in opposite directions, the distance being adjusted by two screws attached by compression springs to the bearings of one shaft. The parrot-beak teeth are 1½ in. long, and of cross-section, at the base, 1 in. by ¾ in.

The results of these tests are shown in Table VI.

TABLE VI.—Coke Crushing Tests.

Type of Crusher.	A One Crushing.	A Two Crushings.	B	C One Crushing.	C Two Crushings.
1	2	3	4	5	6
Yield of coke, per cent.:					
Above 1 in.... ...	6.2	0.1	*Nil*	30.0	13.6
1 to ¼ in.	80.4	85.2	89.0	59.2	73.7
Below ¼ in. ...	13.4	14.7	11.0	10.8	12.7

Crusher B gave the best results, and a machine of this type was therefore installed at Rochdale for further trial. The first test was made on "run of retort" coke from coal F, without preliminary screening, and a yield of producer fuel was obtained with 3% over-size, 16% under-size, and 81% between ¼ and 1 in. A repeat test gave corresponding figures of 1.5%, 8.3%, and 90.2%, which were considered very satisfactory. The sizes in the finished fuel were: 1 to ¾ in., 17%; ¾ to ½ in., 52%; and ½ to ¼ in., 31%.

Cost of Production of Producer Coke.

In Table VII are given calculated costs of production of producer coke at Rochdale and Bradford, the figures being based on the yields given in Table VIII. The carbonizing process has been regarded as a coke production process, and the costs represent the price at which the coke must be sold in order that the production may be economically sound. It has been assumed in calculating these costs that the yield of graded coke will be 80% of the total produced. The figures on which these costs are based have been supplied by the Gas Undertakings concerned.

TABLE VII.—Cost of Production of Producer Coke in Continuous Vertical Retorts.

Works	Bradford. £ s. d.	Bradford. £ s. d.	Rochdale. £ s. d.	Rochdale. £ s. d.
Coal, including handling ...		1 14 9		2 1 3
Salaries and wages		5 10		4 7
Purification		8		
Repairs and maintenance ...		12 6		4 6
Producer fuel		4 6		7 0
Sale of gas	2 18 3		2 17 4	
Sale of benzole	3 1		2 6	
Sale of tar	4 7		3 1½	
S/A	—		—	
		1 11 11		1 6 7½
Net cost per ton of coal ...		£1 6 4		£1 10 8½
Yield of coke per ton of coal, cwt.		12		11.6
Breeze, per cent.		20		20
Net yield, cwt.		9.6		9.28
	£ s. d.		£ s. d.	
Cost per ton of producer fuel	2 14 10		3 6 0	
Cost of cutting and screening	3 0		3 0	
Net cost of producer fuel, per ton	£2 17 10		£3 9 0	

TABLE VIII.—Basis of Costs.

Works	Bradford. £ s. d.	Rochdale. £ s. d.
Costs:		
Coal, per ton	1 14 9	1 19 3
Gas, per therm	4.32	3.0
Tar, per gall.	4.25	2.0
Benzole, per gall.	1 4.6	1 3
Coke dust	No value	
Yields per ton:		
Gas (therms)	67.45	72.00
Coke, cwt. (total)	12.00	11.60
Tar, gall.	15.00	15.00
Benzole, gall.	3.00	2.00

The cost of the product varies considerably at the different works, due to variations in works costs and in the value of gas and by-products. Under the worst conditions the net cost of producer coke

GAS WORKS PLANT

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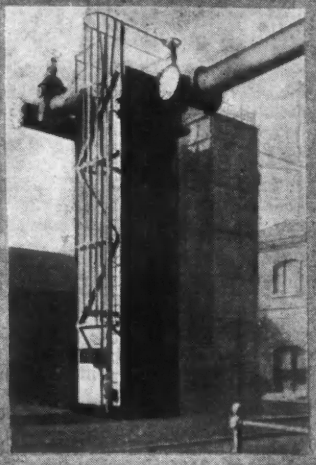
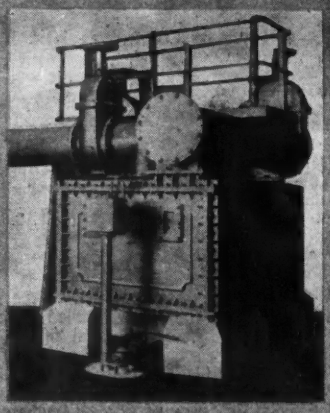
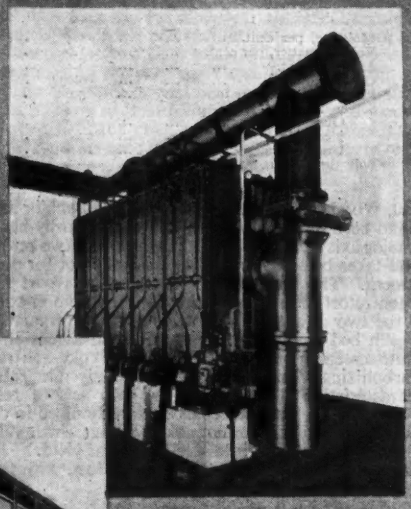
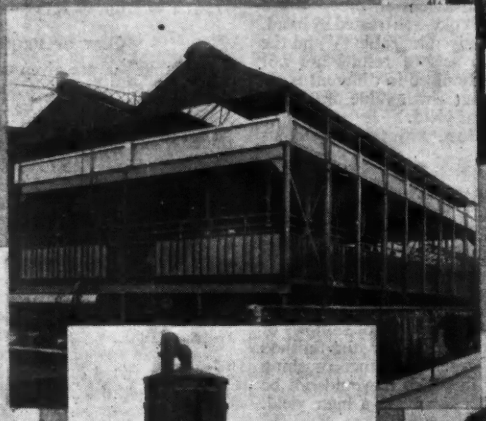
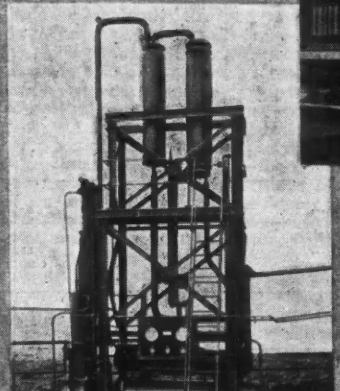
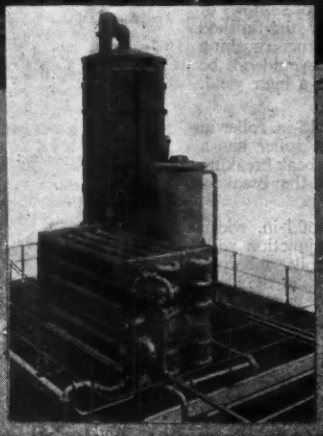

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TABLE IX.—Results of Road Tests with Producer Cokes.

Coke	Coal F (Birmingham)		Coal F (Rochdale)	Coal I (Rochdale)	Coal A (Edinburgh)	Utility Progasite	L.T. Coke (Motor Coalite)
	Activated.	Unactivated.	Unactivated.	Unactivated.	Unactivated.	Activated.	
C.A.B. value	0.064	0.064	0.040	0.040	0.042	—	—
Size of coke	1 to ½ in.	1 to ½ in.	1 to ½ in.	1 to ½ in.	½ to 5/16 in.	1½ to ½ in.	½ to ¼ in.
1	2	3	4	5	6	7	8
Time required for—							
(a) Ignition, sec.	30	30	30	25	—	30	45
(b) Starting, min.	9 to 17	6.30	8	4 to 8	3.85	2.0	1.5
(c) Starting after 30 min. stop, min.	5	—	6	3	—	6.0	—
Length of test, miles	98	98	98	98	108	98	98
Time in gears, per cent.:							
(1)	4.0	0.2	1.9	—	0.4	0.5	0.5
(2)	17.6	15.7	15.6	—	15.5	15.6	17.0
(3)	21.6	27.7	17.8	—	29.3	17.6	16.0
(4)	56.8	57.0	64.7	—	54.8	67.0	66.5
Average speed, m.p.h.	20.0	22.5	21.4	24.0	22.4	24.0	24.6
Calorific value of gas, B.Th.U. per cu.ft.	125	130	—	125	120	130	120
Fuel consumption, lb. per mile	1.45	1.35	1.5	1.3	1.25	1.35	1.30

TABLE X.—Results of Road Tests with Producer Fuels Operating over Short Distances.

Fuel.	Fuel Consumption, lb. per mile.	Time for Lighting, min.	Time for Re-lighting, min.	Average speed, m.p.h.	Remarks.
1	2	3	4	5	6
Utility progasite	1.97	1.30	4.45	16.8 morning 17.8 afternoon	Continual air adjustment necessary.
Coal F coke, C.A.B. value, 0.045	2.33	7.0	3.0	13.5 morning 14.1 afternoon	Poor performance; fuel unsuitable for general use.
Coal F coke, activated	2.10	8.0	2.3	16.6 morning 17.6 afternoon	Ease of operation superior to that of progasite.
Coal H coke, C.A.B. value, 0.045	2.98	8.0	3.0	13.6 morning 17.8 afternoon	Flexibility poor. Continual air adjustment necessary.
Coal H coke, activated	3.13	9.5	2.25	16.7 morning 19.3 afternoon	Good performance. Better than progasite.

at the works was £3 9s. per ton. (No credit is given for coke dust below ¼ in. in size.)

Schemes have been prepared for the bagging and distribution of the coke, and at Birmingham the output of the experimental retorts has been sold to certain vehicle operators for the past two years. On the basis of this experience, the cost of bagging has been estimated at 2s. 3d. per ton. The cost of the bags themselves is also a relatively heavy item; the paper-lined bags originally used at Birmingham lasted for only four journeys, but the stronger jute bag subsequently used would probably last for twenty. On this basis, the cost of bags is 3s. per ton of coke, and the gross cost of bagged fuel at the works £3 14s. 3d. per ton. The figures in Table VII clearly show the importance from the point of view of costs of obtaining the maximum yield of sized product.

Results Obtained in the Operation of Producer-Gas on Coke.

In Table IX are collected representative test results obtained by members of the Producer Gas Experimental Panel of the Ministry of War Transport, using the various cokes described in this Paper. The results were obtained on standard test vehicles operating to a fixed schedule over the same route, and are therefore directly comparable. These test vehicles were Bedford 6-cylinder trucks of 27.34 h.p., with a 3-ton pay-load. The standard Government Modified Producer and fuel together weighed about 15 cwt., making the total load 3 tons 15 cwt.

The suitability of a fuel for mobile producers may be assessed by—

(*a*) The time required for ignition and to obtain sufficient gas for the vehicle to be started.

(*b*) The percentage time during which the various gears are used.

(*c*) The average road speed.

The flexibility of the engine, which depends largely on the quality of the gas and the rapidity with which the fuel bed adjusts itself to varying loads, is not easy to assess. The expert driver can distinguish between the different fuels by the "feel" of the vehicle, but it is impossible to express this numerically. A useful guide to comparative flexibility is obtained by noting the time involved before the vehicle can be driven away after a stop in the course of the day's operation. Where the operating schedule includes a large number of stops, flexibility becomes a major factor, and more reactive fuel is essential for this type of work.

The results of road tests are, therefore, given in two sections—(*a*) long-distance tests and (*b*) short-distance tests, including a number of stops.

The figures in Table IX show that in the hands of the experienced driver, unactivated coke with a C.A.B. value of 0.04 to 0.05 gives a satisfactory performance when operation is continuous, and even with 0.06 C.A.B. fuel, vehicles can be operated, although there is a long delay in obtaining sufficient gas to start the vehicle.

In the hands of the inexperienced operator the performance is always less efficient. The above fuels have all been tested by commercial operators, and the results indicate that difficulties occur unless the C.A.B. value is of the order of 0.04 to 0.05. In some cases ash distribution has been irregular and clinker troubles have arisen which give discrepant results.

It has always been considered that producer gas was suitable only for long and medium distance operation, but it has been necessary to consider the use of producer gas in relation to all types of work, and trials on delivery service have served to emphasize the difference in flexibility between different fuels. Vehicles operating on this type of work require a more reactive fuel than those operating on longer runs.

During the present war long-distance haulage has been severely curtailed and the majority of civilian vehicles have been operating over relatively short distances. Although these conditions may be generally regarded as unsuitable for producer-gas vehicles, it was considered wise to examine their effect. A special test schedule was therefore devised to test certain producer fuels. The standard course was 33½ miles in length, and included 33 stops during approximately eight hours' operation. Under these strenuous conditions the unactivated cokes proved to be definitely unsuitable, but activated cokes gave actually better results than anthracite (progasite). Results with different fuels are given in Table X.

In view of the variations in vehicle performance obtained with different batches of cokes of the same C.A.B. value, detailed size analyses were made, and in some cases the coke was re-screened. The results of road tests with the original and re-graded cokes are given in Table XI.

TABLE XI.—The Effect of Size of Coke on Producer Efficiency.

Fuel	Coal F Coke, Sample 1.			Coal F Coke, Sample 2. Unactivated.	
	Unactivated. (*a*)	Activated. (*a*)	Unactivated. (*b*)	(*a*)	(*a*)
1	2	3	4	5	6
C.A.B. value	0.050	0.050	0.050	0.048	0.048
Screen analysis:					
Above ¾ in.	30.3	30.3	*Nil*	10.6	*Nil*
¾ to ½ in.	54.3	54.3	32.5	57.1	62.1
½ to ⅜ in.	12.6	12.6	47.0	29.4	37.0
⅜ to ¼ in.	0.6	0.6	18.1	0.6	7.7
Below 5/16 in.	2.2	2.2	2.4	2.3	0.9
Road tests:					
Ignition time, sec.	45	30	45	30	30
Time to move off on gas, min.	7.0	4.0	3.0	4.5	4.5
Road speed, m.p.h.	23.0	25.2	25.6	24.6	25.0
Calorific value of gas, B.Th.U. per cu.ft.	103.5	117	117	105.3	113.0

The results in Table XI show that in the case of coke sample 1, with the screening analysis (*a*), poor results were obtained when the coke was unactivated, but when it was re-graded as shown in (*b*) to reduce the percentage above ¾ in., an appreciably better performance was obtained. Considerable overheating had taken place in the first tests, and this also was eliminated by the re-grading. For comparison, a sample with the same screen analysis (*a*) was activated, and the results show that there is little difference in performance between the activated and the re-graded coke.

The original grading of coke sample 2, as shown in (*a*), was more suitable, and its results were correspondingly better; re-grading therefore gave a smaller improvement, as shown in (*b*).

The size range originally agreed upon was ¾ to 1 in., but this had been increased in order to obtain a higher yield of product per ton

of coal. These results suggest that where a more reactive coke is required for short-distance operation, the use of a specially-screened product may avoid the necessity of alkali activation. The subject requires further investigation and confirmation, but the correlation of size and C.A.B. values with flexibility is of considerable interest.

Large-Scale Production of Reactive Coke in Gas-Works.

It has been demonstrated that a suitable fuel for transport producers can be made in continuous vertical retorts, provided that suitable coals are available, and that although this may involve a small reduction in the yield of gaseous therms per ton, there is no loss in gaseous thermal output per retort. It was necessary, however, in planning a large-scale Gas Producer Scheme to know how rapidly and to what extent the Gas Industry could be organized for the large-scale production of these special cokes.

This problem had previously been considered by the Henley Committee of the Mines Department, to whom schemes had been submitted by the Gas Research Board and by B.C.U.R.A. In 1944 the Chemical Advisory Committee of the Ministry of War Transport was asked to re-examine the problem and to submit recommendations for a suitable scheme. Two possibilities were considered:

(i) The immediate provision of coke for an emergency in which conversion of vehicles to producer gas would be required in the shortest possible time.

(ii) The planning of coke production for a possible future emergency. In this case it was assumed that there would be adequate time to install any additional plant necessary. The schemes considered were based on the production of (*a*) 500,000 and (*b*) 1,000,000 tons of reactive coke annually—*i.e.*, sufficient to operate 25,000 or 50,000 vehicles.

Fortunately the emergency arrangement has not been necessary. The production of reactive coke is, however, of considerable importance to the Gas Industry, and the figures in Table XII give a general indication of the potential output of reactive coke from works selected to serve the various regions, and of the supplies of special coals required. Exact estimates are not possible, as production at any particular works must depend on local considerations.

TABLE XII.—Potential Production of Reactive Coke by Gas Undertakings.

	Emergency Scheme.		Long-Term Scheme.			
Region.	Normal Supply of Suitable Coals, tons per annum.	Estimated Yield Reactive Coke, tons per annum.	Maximum Output Reactive Coke from Selected Works, tons per annum.	Supply of Special Coals Required, tons per annum.	Reactive Coke Required in Region, tons per annum. (*a*)	Reactive Coke Required in Region, tons per annum. (*b*)
1	2	3	4	5	6	7
1	*Nil*	*Nil*	45,600	120,100	26,300	52,600
2	28,900	11,000	108,400	285,200	51,800	103,600
3	114,000	43,300	135,500	356,500	64,300	128,600
4	35,550	13,500	100,400	264,400	50,300	100,600
5	17,500	6,700	202,300	532,300	90,900	181,800
6	58,250	22,100				
7	45,000	17,100	To be supplied with South Wales Anthracite.			
8	*Nil*	*Nil*				
9	735,100	279,300	150,500	396,100	66,100	132,200
10	244,500	92,900	163,100	429,300	78,700	157,400
11	*Nil*	*Nil*	124,200	327,000	34,000	68,000
12	"	"	73,300	192,900	37,600	75,200
Totals	1,278,800	485,900	1,103,300	2,903,800	500,000	1,000,000

From Table XII it can be seen that 21 works can be selected with capacity sufficient to produce reactive coke to meet the requirements of the larger scheme—*i.e.*, 1 million tons per annum. The supplies of special coals required would be approximately 3 million tons per annum, and, as shown in section (3) (*b*), the annual production of such coals is estimated at 12 million tons. This arrangement whereby certain works are set aside for the production only of reactive coke is considered advisable because of the difficulties of separate handling and supervision, of the large-scale provision of special screening plant, and of the distribution of the special coals involved in the production of ordinary and reactive cokes in the same works.

Future Uses of Reactive Cokes.

The necessary technique for the manufacture of the fuel and for the operation and maintenance of producer gas-driven vehicles has now been learned, but producer gas is still inferior in many respects to liquid fuels, and there still remain problems both in the manufacture of fuel and in the operation of vehicles on any large scale. Engines of larger cylinder volume and higher compression ratio (up to 8) and an improved design of producer may eliminate some of the disvantages, but experience in this and other countries has shown that the use of producer gas for transport will be continued in peace-time only if the overall cost is considerably lower than that of available liquid fuels. The fuel cost for a 5-ton truck operating on producer fuel at, say, 100s. per ton would be approximately 10d. per equivalent gallon of petrol. It is considered that at these prices producer gas would not find more than limited use for peace-time transport; the fact that the operation of 100,000 heavy vehicles on producer gas would save the importation of 1 million gallons of motor spirit may, however, be worthy of consideration.

The success which has been obtained, however, in the manufacture of reactive producer coke by using methods of carbonization but little modified from those in common usage with continuous vertical retorts suggests strongly that the process should be developed in order to provide for general use carbonized fuels which are of a higher order of reactivity than that of the cokes now being marketed by the Gas Industry.

The desire for a cleaner atmosphere in this country has given rise to the use of low-temperature coke and to a variety of coke-burning appliances, but the latter have not found their full application in that they have had to be special to a degree, in order to overcome the inadequate reactivity of many gas-retort cokes. The choice of special coals, however, could be extended to ordinary coke manufacture wherever possible, in order to provide reactive cokes for both industrial and domestic markets, and the introduction of reactive cokes into a market already served by the combustion of unreactive coke in special appliances need not be a serious inconvenience, provided these appliances give complete control over the supply of primary air. The overall result would, indeed, be more satisfactory in providing additional flexibility in control. Further, the fuel would find a ready application where coal-burning grates only are available. The use of special coals and probably some modification of carbonizing temperature might involve some sacrifice of gas yield and calorific value if not of gas output, but this should be more than compensated for by improvements in coke markets.

This idea is not new, and has been examined practically with some success in both Liverpool and Edinburgh. At Liverpool experimental work started as long ago as 1927,* using horizontal retorts, and it continued with Woodall-Duckham 74-in. upwardly-heated retorts, using size selected coals (81.5 to 83% carbon), and substantially high-temperature conditions, 1,045°C. top to 1,330°C. bottom. The resulting fuel had a C.A.B. value of 0.045, and gave a satisfactory performance in the open grate. The addition of lime and soda to the coal before carbonization, or of soda alone to the coke, gave a much more reactive fuel, of C.A.B. value 0.03, too reactive indeed for the open grate. With alkali-activation it was established that a coal of higher caking power (carbon 83 to 84%), and therefore involving less sacrifice of gas yield, could be used to provide an open-grate fuel having a C.A.B. value of 0.04.

Similar experiments, using graded Scottish and Northumberland coals (carbon about 82%) and rather lower carbonizing temperatures in a downwardly-heated Woodall-Duckham retort (1,200°C. top to 900°C. bottom), gave equally promising results,† although at a sacrifice of gas yield of 22 therms per ton or about 20% of output. The fuel gave in a well-type grate a performance almost equal to semi-coke, and proved highly acceptable in the Edinburgh market.

In this country there are probably many localities in which suitable graded coals can be made available, and there seems no doubt that, when retorting capacity is restored after the war, extended markets could be developed for reactive cokes for both domestic and industrial purposes. Further, with the likely advent of processes of complete gasification, it should be possible to consider the use of carbonization plant less from the rigid standpoint of gas manufacture and more from that of the manufacture of reactive coke in addition to gas.

Acknowledgments.

It will be appreciated that the results described in this Paper are due to the work of various teams over a number of years, both on the problems of fuel production and on its utilization in producer gas-operated vehicles. A considerable proportion of the experimental work has been carried out at the Fuel Research Station under Mr. A. Fitton with regard to road and engine trials, and under Mr. D. McDougall and Mr. Bardgett on questions of carbonization and coke

* Thomas, H. H., and Askey, P. J., *Trans. Inst. Gas Eng.*, 1939–40, **89**, 598.
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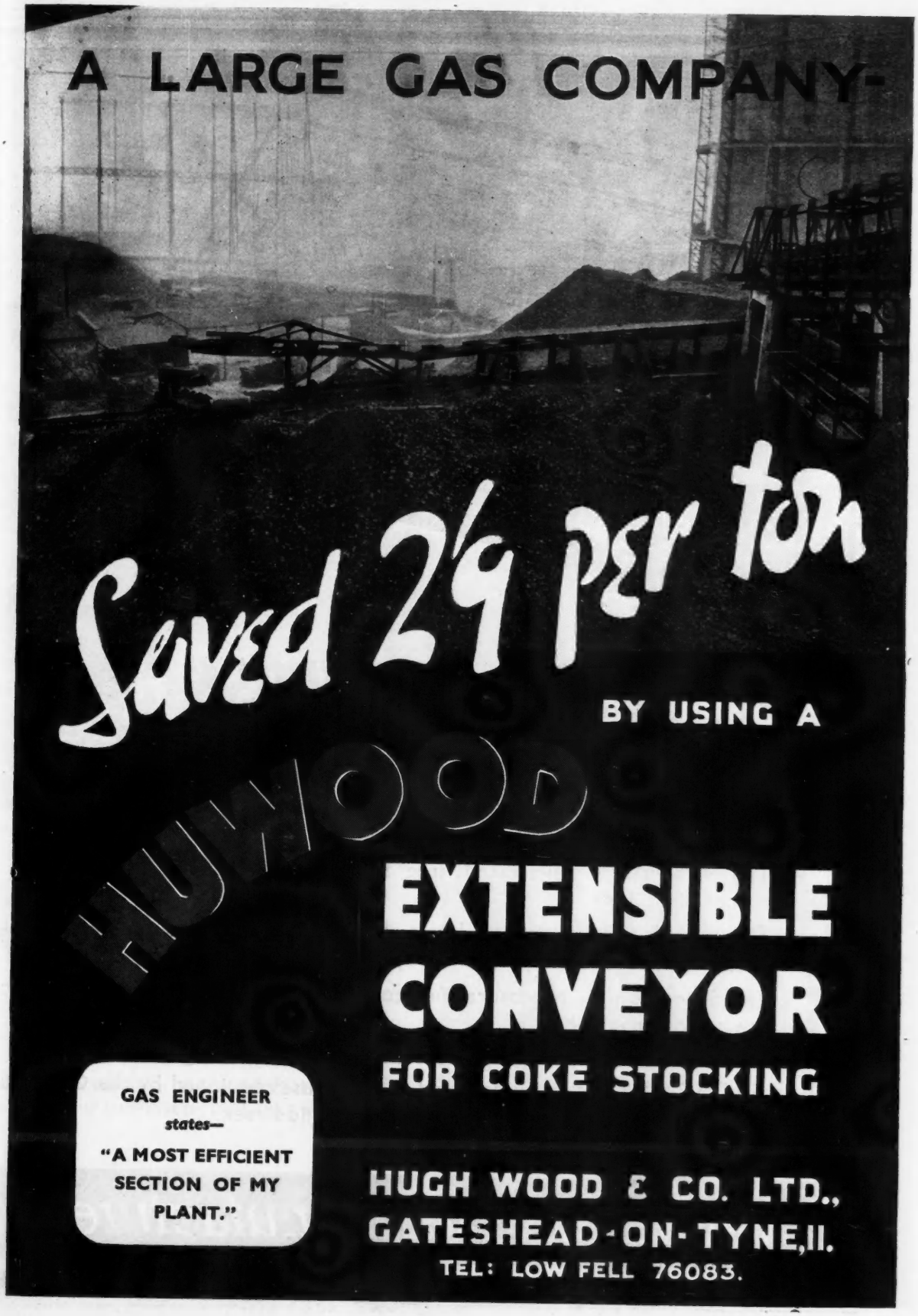
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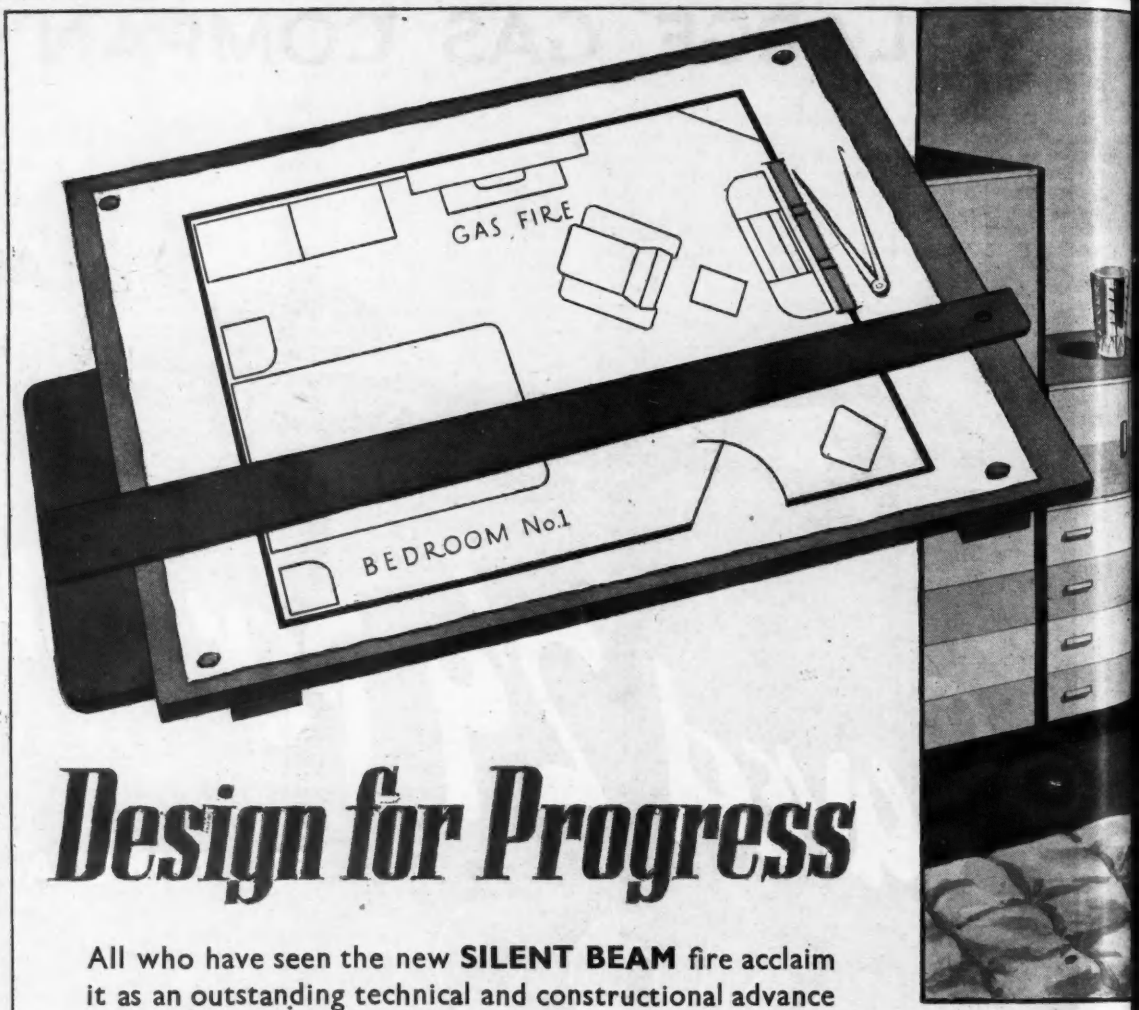

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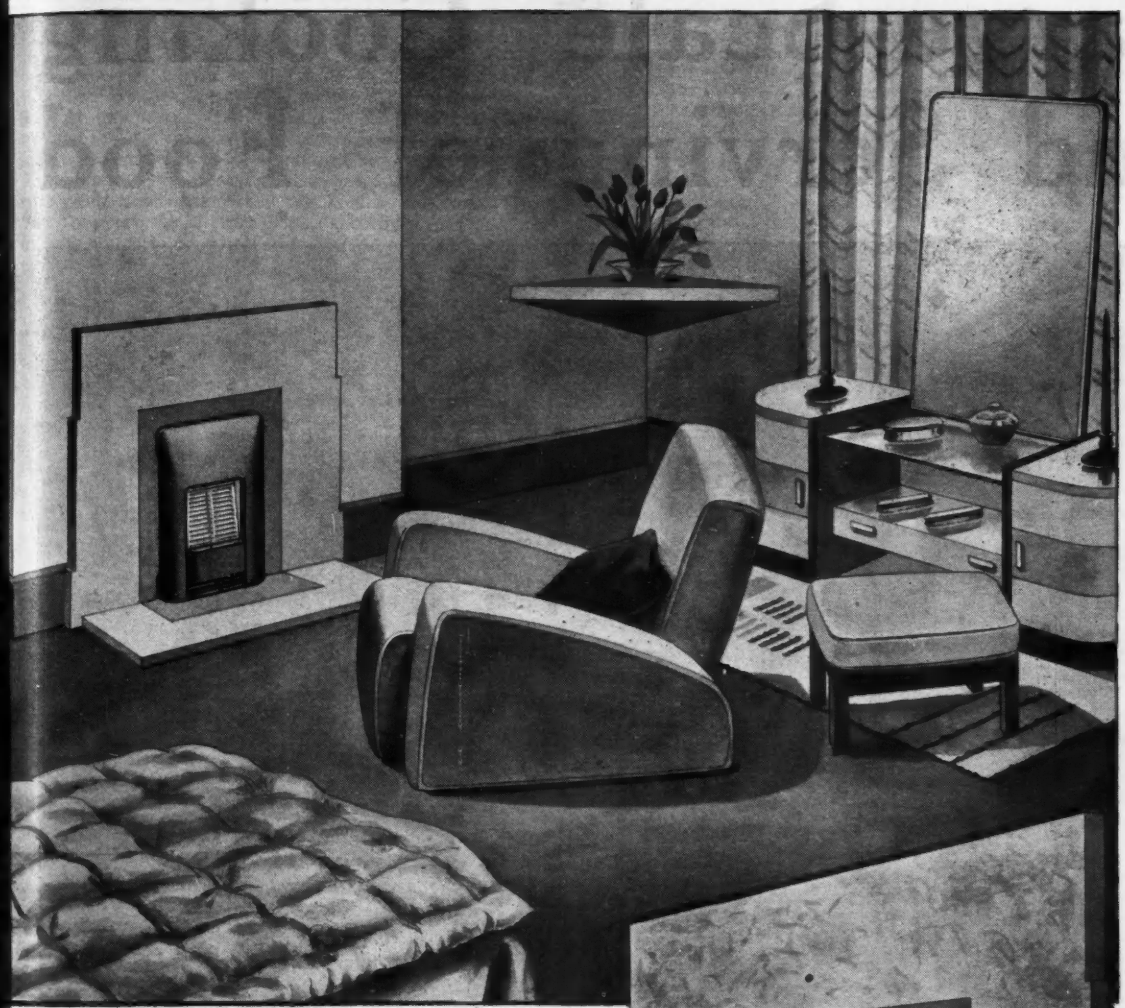

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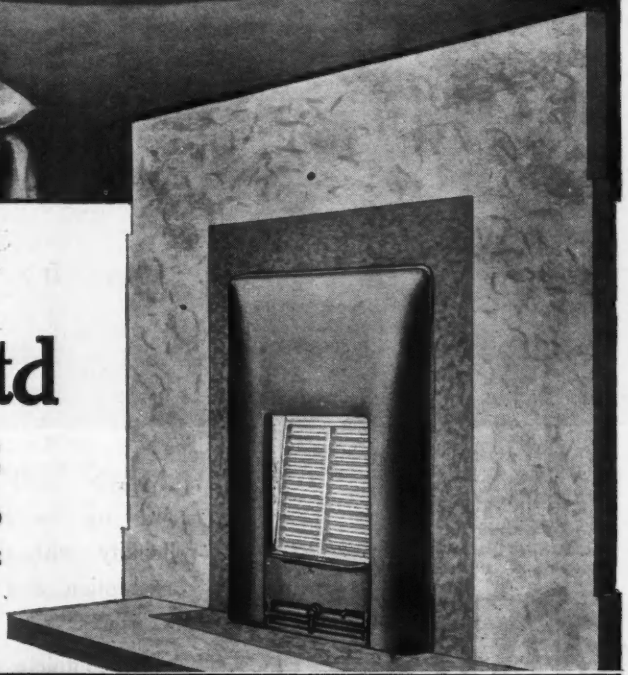

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sizing. The Fuel Research Survey records were an essential factor in the choice of coals. On the production side, the Gas Research Board and the officials of various Gas Undertakings have arranged for special tests, and the Authors would like in particular to express their appreciation to Mr. J. Jamieson, Mr. T. F. E. Rhead, Mr. C. H. Bamber, Mr. G. E. Currier, and Dr. F. J. Eaton for their generous help. Acknowledgment is also made to the Ministry of Supply (Chemical Warfare Department) for providing facilities at Rochdale for coke production. The members of the Operators' Experimental Panel of the Ministry of War Transport have been responsible for the road tests on the various fuels, and the Chemical Advisory Committee for the general direction of the later stages of the work on reactive coke production. Acknowledgment is also made to the Ministry of War Transport, the Ministry of Fuel and Power, and the Department of Scientific and Industrial Research for permission to publish the results of this work.

APPENDIX.

Details of Coals Used in Tests.

Coal.	Commercial Name.	Coalfield.	Seam.	Gray-King Type.
A	Loanhead	Lothians	South Parrot	D
B	Sherwood Hards	Notts and Derby	Top Hard	D
C	Clipstone Hards	Notts	Top Hard	D
D	Deep Duffryn	South Wales	Nine Feet	BC
E	Ashington Doubles	Northumberland	High Main	CF
F	Bentinck Nuts	Notts and Derby	Deep Soft	FG
			Low Main	EF
G	Ormonde	Notts and Derby	Kilburn	G
			Tupton	CD
H	Brodsworth	South Yorks	Parkgate	EF
I	Bullcroft	South Yorks	Barnsley	EF
J	Ackton Hall	West Yorks	Warren House	G_3
			Silkstone	DG
K	Annesley No. 2	Notts and Derby	Deep Soft	F

Distillation of Wood in Glover-West Vertical Retorts

By M. P. BLANC,

Engineer to the Cie Française d'Eclairage et de Chauffage par le Gaz

[Translated]

THE Gas-Works of Niort is situated in proximity to several forests in which the manufacture of charcoal is organized by the Distribution des Eaux et Forêts. Our Manager, who found himself particularly well placed to obtain supplies of wood, was therefore much interested in 1940 in the distillation of wood in horizontal retorts. To cope with the difficulties arising out of the supply of coal, he was favourably disposed to proceed with a test if the Glover-West retorts at his disposal should prove suitable.

Having ascertained that there would be no difficulty in passing wood through the Glover-West retorts, our Manager embarked on an experiment. He decided to verify that it would not only be possible to obtain a certain quantity of gas, but also to produce charcoal of good quality. The tests were carried out on 20 m³ of wood with a total weight of 12,680 kg. This wood, composed of large logs of walnut split and cut to 20 cm. in length, was distilled in a single retort over a period of about 60 hours.

During this experiment the amount of wood distilled in proportion to coal was about 35%, and no special arrangements were made for the elimination of the wood tar and liquors which were mixed with the condensates of the coal gas.

The results obtained were as follows:—

(1) Charcoal:

2,295 kg. total, say, 181 kg. per ton of wood distilled (18.1% by weight). (This result must be regarded as satisfactory in view of the fact that carbonization in the forest gives normally 150 to 187 kg. per ton of wood.)

Screening gave—

1,928 kg. suitable for producers, or 83.8% of the total.
187 kg. of smalls, or 8.2% of the total.
180 kg. of dust, or 8% of the total.

(2) Gas:

The production of gas was about 35 m³/hour (29,665 cu.ft. per day), say, 2,100 m³ total corresponding to 165m³ per tonne of wood (5,910 cu.ft. per ton).

During the test the maximum gas made at a calorific value of about 4,020 cal. (420 B.Th.U./cu.ft.).

Circumstances rather than curiosity led our Manager to ascertain what could be done with the distillation of wood on a larger scale. Indeed, at the beginning of May, 1941, the stock of coal at our Works at Niort was so low that, in order to avoid a stoppage, it was imperative to have recourse to wood. It was for this reason that, during about a fortnight, the daily distillation of wood reached 8 to 10 tonnes per 24 hours, or about 65% of the weight of coal carbonized during the same period.

As these operations are on such a scale as to permit of the formation of a definite opinion on the distillation of wood in Glover-West retorts, the following details and observations are given.

Settings

The carbonization of wood has been carried out in one setting of two retorts rated at 2,700 kg. of coal per 24 hours.

Regulation of the Setting

Temperature at the 2nd combustion chamber, *circa* 750° against 1,150° for the distillation of coal.
" " 3rd combustion chamber, *circa* 900° against 1,180° for the distillation of coal.
" " 4th combustion chamber, *circa* 950° against 1,200° for the distillation of coal.
" " 5th combustion chamber, *circa* 950° against 1,200° for the distillation of coal.
" " 6th combustion chamber, *circa* 870° against 1,180° for the distillation of coal.

It is probable that lower temperatures would have been sufficient; the charcoal obtained was a little too much "burnt-off." Besides this, temperatures were reached with a consumption of producer gas relatively reduced, the opening of the main damper being only 3 cm. against 10 cm. in the other settings. Perhaps there was combustion of a portion of the wood-gas passing through the walls of the retorts.

Operation

The commencement of carbonization is carried out exactly as with coal—that is to say, the retorts are first filled with coke. The speed of extraction was regulated according to the degree of humidity of the wood; with wet logs, unburnt-off pieces were found with extraction at 4 teeth; on the other hand, with very dry wood, 8 teeth were adopted at the beginning and then 7 or 6 teeth some hours after corresponding with the supply of wood.

Under these conditions the first pieces of charcoal appeared 12 hours after charging. The setting was capable of dealing with 4 to 5 tonnes of wood per retort per day, giving a total of 2 to 2.5 tonnes of charcoal per 24 hours.

Our Manager states that an extraction speed of 7 or 6 teeth was rather too slow, the charcoal being a little too much burnt-off, but that he was obliged to adopt this speed because the means at his disposal for cutting, handling, and charging the wood were not capable of more than 10 tons per 24 hours.

The following are some details of the preparation of the wood:

In the preliminary trial the wood was cut with a circular saw; it can quite well be cut with an axe, with 3 or 4 cuts per metre, giving pieces 33 or 25 cm. long.

At the juncture when the stock of coal was reduced to three days with no immediate prospect of further supplies, it was found that the cutting of the wood by saw or axe was much too slow. The pieces were then increased to 50 cm. in length and sometimes entire faggots were charged to the retorts.

The question of the preparation of the wood in a form suitable for its easy introduction into the Glover-West retort is not solved; for an installation of any size it would be necessary to devise appropriate machinery.

Charging of the retorts is done by hand every half-hour by the oval door in the top mouthpiece. The wood was elevated in the lift, the supply being slow and requiring much handling. The presence of one man was necessary for the whole time to barrow the wood from the lift to the retorts, to open the oval door and to charge the retorts.

Steam was admitted to the retorts at a pressure before the diaphragm of about 50 g. against about 230 g. normally with coal, for the treble purpose of cooling the worm extractor and lower ironwork of the retorts, quenching portions of the charcoal which might be at the ignition point, and ensuring a certain humidity at the joint of the discharging door to increase its tightness.

Discharging was carried out every two hours. The charcoal came out cool as long as the door was tight. As a precaution the charcoal was always left for some hours in the skips (charcoal boxes).

Treatment of the Gas

Our Manager deemed it imperative not to pass the wood-gas direct to the collecting main common to the settings 2 and 3 in order to eliminate all risk of attack of the sheeting by condensed acetic acid. He therefore improvised a special arrangement for the condensation of the wood gas. From the outlet of the retorts the gas was directed by way of an intermediate vertical collector to two old horizontal retort hydraulic mains placed at ground level, through which it passes in series without dip. The vertical collector was provided, at the top, with mechanical liquor sprays for the double purpose of cooling the gas and effecting a preliminary neutralization of the condensed liquors. (In case of need, as for instance if the collector or the mains require cleaning, the wood gas could be temporarily sent into the collecting main common to the settings 2 and 3 by opening a blank flange provided for this purpose.)

The gas, after passing through the two mains, enters the works main at the outlet from the atmospheric condensers. It then follows the same path as the coal gas, and the acid vapours which might persist are neutralized by the ammonia of the coal gas.

It was ascertained that condensates which were acid at the hydraulic mains were always alkaline after the passage of the mixed gas to the ancillary plant when the proportion of wood distilled to coal carbonized represented about 65%.

The cooling of the wood gas was as follows:

Temperature at the	outlet from the retort	180°
,, ,,	inlet to the first main	94°
,, ,,	outlet from the first main	87°
,, ,,	outlet from the second main	75°

The composition of wood gas appears to be much less regular than that of coal gas. It seems to depend to a great extent on the nature and dimensions of the wood carbonized as well as on the operation of the plant. Our works, which is not equipped for complete gas analysis, has, however, made rapid determinations of CO_2, O_2, and CO. The average results of these analyses are as follows: CO_2, 28%; O_2, *nil*; CO, 25%. It has not been possible to determine the calorific value of the wood gas except by deduction from the calorific value of the mixed gas on the one hand and the gas made from coal alone. The deduction is that the calorific value gross of the wood gas is between 3,000 and 3,500 cal. (340–390 B.Th.U./cu.ft.). The density of this gas would be about 0.75.

In view of the somewhat sketchy methods employed, these figures are given with all reserve. At the same time it is to be noted that the wood gas mixes well with the coal gas, the quantity of gas produced on the average during the period under consideration being about 200m³/tonne (7,176 cu.ft./ton). Further information shows that the yield has been sensibly improved by reducing the appreciable losses incurred during charging.

About 580 kg. of condensates were obtained per tonne of wood distilled, comprising about 50 kg. tar and 530 kg. of other condensates. The tar is fluid when hot and similar in appearance to coal tar. Cold, it becomes very viscous. Its market value is not negligible in view of the fact that it can be used either for road-making or in the manufacture of briquettes.

The liquors, yellow in colour on condensation, darken strongly on cooling, becoming dark brown. They contain 8 to 9% by weight of acetic acid.

The charcoal, thanks to the extractor, comes from the retorts with reduced dimensions and there is practically no need to break it for use in the producers. It has a good appearance, grey, slightly silvered, with a metallic ring, is very hard, breaking with difficulty with a sharp bright section.

Analyses of several samples give the following results:

Humidity		About 2%.
On the dry basis	Volatile matter	8 to 12%
	Ash	2 to 2.5%
	Fixed carbon	85.5 to 90%

On screening it leaves on inclined sieves a proportion of breeze and dust of the order of 12%.

Conclusions

The tests at Niort show that the carbonization of wood in Glover-West vertical retorts is practicable, and gives results interesting from the point of view of both gas and charcoal. The production per retort is from 1,000 to 1,200 m³ of gas (35,000–42,000 cu.ft.) per diem at 3,200 cal. (360 B.Th.U./cu.ft.) and about 1 tonne of charcoal of good quality.

At the same time, certain difficulties were revealed which it would be necessary to remove if the process is to be pursued. The following are some suggestions:

(*a*) Preparation of the wood: It would be necessary to use a machine capable of cutting the wood into pieces 5 to 6 cm. long with the minimum of splinters and with a capacity of at least 2 tons per hour.

(*b*) Feeding the wood to the retorts: Charging by hand, even though the speed of extraction is limited to 6 or 7 teeth, necessitating opening the oval lid on the top mouthpiece frequently with the following disadvantages: Considerable loss of gas; arduous work for the man, inconvenienced by the pungent odour of the wood gas. Further, with this method of feeding, voids are produced between the pieces of wood which lower the quality of the gas and may produce a too rapid descent of some of the pieces. Our Manager asks whether it would not be possible to feed the wood in a similar manner to coal, and he concludes that the wood could easily be handled by the Hunt conveyor, the bunker, and the feed hoppers if it was in pieces 5 to 6 cm. long. Under these conditions it would pass the feeding valves without serious hanging. It would no doubt be necessary to modify the bottom of the coal bunkers to enlarge the two existing restrictions.

Condensation of the tar and liquors: The somewhat sketchy system of condensation installed effects the purpose only imperfectly. Indeed the liquor condensed in the hydraulics only represents about a half of the total condensates produced. The balance is found in the syphons of the ancillary works plant, which contain a mixture of coal tar and ammonia liquor with wood tar and liquors. The ammoniacal liquor is impoverished in volatile salts and the production of sulphate becomes impossible. The mixture is, therefore, evacuated to the sewer with a consequent loss of ammonia and appreciable quantities of acetic acid. The solution of this problem would evidently consist in providing for the wood gas its own condensing apparatus in which all the tar and liquors would be collected. Up to the present it has not been possible to study this question in full detail, but in our opinion it merits full examination with the assistance of specialists.

Finally, we can say that Glover-West vertical retorts permit of the distillation of wood under conditions at least as interesting as those of horizontal retorts, and particularly if the proportion of wood to coal is kept in the neighbourhood of 20 to 25%.

Perth Gas Department proposes to increase the price of gas by 3d. per thousand cu.ft., and the price of coke by 2s. 6d. per ton. The price of coke to date has been 8s. 6d. below the maximum. It is estimated that the increases will yield £8,100, which will still leave an estimated debit balance of £7,000.

Watford and St. Albans Gas Company has made an innovation this year in presenting its welfare accounts and reports to co-partners in pictorial form, instead of the usual report style. Stock owned by co-partners amounts to £33,900, and during the year to March 31 the 729 co-partners received £7,600 in bonus and £900 in interest. Under the pension scheme £6,300 was paid out during the year, and the amount paid by the Company to pension funds since 1930 now amounts to £131,700. There are 544 regular savers in the National Savings Group, and their total savings during the war have reached £27,200. Charitable contributions amounted to £250; £300 was paid to hospital and nursing schemes, and 1,715 parcels were sent to employees on active service.

Aluminium in the Kitchen is the main theme of an exhibition of post-war gas kitchens at Radiant House, St. Helens, the opening of which was attended by members and officials of several South-west Lancashire local authorities. Arranged by Mr. R. L. Greaves, Engineer and General Manager of the St. Helens Gas Department, the exhibition owes much to the enterprise of Littlewoods, who, during the war, played a great part in exploiting the properties of aluminium in aircraft construction and have realized its possibilities in the manufacturing of gas ranges, cabinets, and fittings of all kinds for the domestic kitchen. The exhibits include a package kitchen suitable for installation in any home and incorporating a built-in cooker, refrigerator, water heater, sink, draining board, and racks and cupboards for utensils.

There have been many important changes in the administration of the Factory and other Acts in the past few years, and the need for an up-to-date and comprehensive guide to such legislation has been met by the publication of the 16th edition of Redgrave and Owner's *Factories, Truck, and Shops Acts*, by Joseph Owner (Butterworth & Co., Publishers, Ltd., 35s., postage 10d. extra). Since the publication of the 15th edition the powers of the Home Secretary under the various Acts have been transferred to the Minister of Labour, and in pursuance of the powers granted to the Minister under the Defence (General) Regulations, numerous orders have been made extending and modifying requirements which apply to factory and other premises. Important decisions have been given in the courts in connexion with various sections of the Acts and Regulations made in pursuance of the Acts. These are noted in the new edition under the appropriate requirements and cross-references have been made where necessary. An alteration has been made in the arrangement of the new edition, and the various Codes of Regulations are now printed after the Act under which they have been made.

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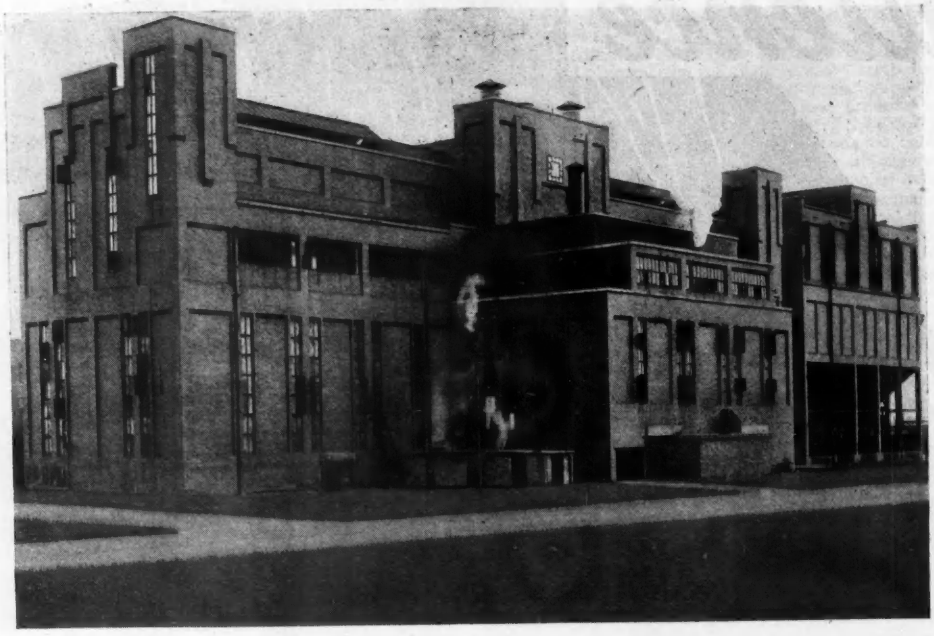

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COMMUNICATION No. 230—PROCEEDINGS OF THE INSTITUTION OF GAS ENGINEERS 1939-40, p. 455.

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Primitiva Gas Company

The annual meetings of Primitiva Holdings, Ltd., and the Primitiva Gas Company of Buenos Aires will be held in London next Tuesday. In his statement issued to shareholders with the report and accounts of the Holdings Company, Mr. W. M. Codrington, Chairman, states that since the last annual meeting the whole of the Company's affairs have been overshadowed by the expropriation of the Company's assets in Buenos Aires, which were handed over on Mar. 5 this year to the Argentine State Oilfields known as Y.P.F.

In the Primitiva Gas Company, despite the uncertain conditions which prevailed, the number of consumers increased by 4.2% while the quantity of gas sold went up by 4.9%. Both the quality of the gas supplied, and the services given by the Company, were maintained. The accounts of the Gas Company show that during the year 1944 the balance of the (1911) Debenture stock was redeemed, which at the end of 1943 stood at £379,356. Sundry creditors show an increase of £326,000, which arises mainly from increased provision for taxation. On the assets side there has been a substantial increase in cash, but the total of floating assets does not differ materially between the two years.

An agreement has been signed by the Y.P.F. for the sale to them of all stocks of piping, materials, and cookers at unit prices mutually agreed upon, and an instalment of £155,000 has been received by the Company in respect of this transaction. The final price will only be settled when a joint physical stocktaking has been completed.

In the Gas Company's revenue account there is a substantial increase in revenue which is more than offset by increased loss in exchange and higher taxation. On balance the net profit for the year was some £3,000 less than in 1943, but in view of the embargo claimed by the Municipality of the City of Buenos Aires on the expropriation deposit in respect of alleged excess profits the Directors of the Gas Company have been unable to recommend a dividend. Subject to this claim the carry forward of the Gas Company has been increased by some £44,000 to a total of £117,000.

Of the Holding Company's subsidiaries, the Province of Buenos Aires Gas Company made a normal profit, but in view of possible local developments, no dividend was declared. The operations of the Buenos Aires Industrial Supply Company came to an end with the expropriation of the Primitiva Gas Company; its fleet of steam tractors and trailers in Buenos Aires has been sold to the Y.P.F. at a fair price.

These results are reflected in the accounts of the Holdings Company, where the gross income is down by £36,700, which in turn has meant that the net profit, after providing for sinking fund on the Preference stock, has been reduced from £50,100 to £13,000. The Directors recommend the usual Ordinary dividend of 4%, less tax. It is not possible to say how soon the end of litigation in Buenos Aires will enable the Gas Company and other subsidiary companies to be wound up.

The situation in connexion with the expropriation of the Gas Company was dealt with at length in the review circulated with the accounts last year, and the available information was brought up to date in a circular issued to shareholders last March, in which the Directors explained the nature of the claim advanced by the Municipality for "excess" profits, in support of which they had obtained an embargo on the money deposited in court for the Company's account. Since March 23 the embargo has been withdrawn by one judge and re-imposed by another, and the latest information is to the effect that it has been confirmed by the Civil Chamber. Further action will be taken by the Company.

The Chairman's statement continues: "I can report but little progress in the main legal proceedings for the determination of the value of the assets taken over from us by the Y.P.F. You will remember that after the expropriation had been initiated, the present Argentine Government issued a decree modifying the original law under which action had been taken. In brief, the Expropriation Law provided that in the task of assessing the compensation to be paid, the court should have the assistance of experts, whom the parties may appoint. The decree abolishes this procedure, and provides in effect that the court shall appoint a single expert with limited functions. In a case which we claim to be analogous to ours, the Supreme Court has ruled that this decree is in part unconstitutional. In our own case which we claim to be analogous to ours, the Supreme Court has ruled that this decree is in part unconstitutional. In our own case on this point before the Federal Judge, judgment was given against us. We are therefore appealing to the Federal Court. Only when this question has been settled can the valuation of the Company's assets proceed. As the matter is *sub judice*, I will refrain from further comment on the legal aspect, save only to repeat my confidence that the impartial judges of the Argentine Courts will in due course see that justice is done.

"Moreover, in April, 1944, the Argentine Minister of Agriculture gave us an assurance—which we regard as perfectly sincere—that we shall receive fair comepnsation to the last cent. We have confidence in this promise made on behalf of the highest Argentine Authorities. Practically the whole of our junior staff were taken over by the Y.P.F., but our local committee, under the guidance of Señor A. Iturbe, and Mr. Grant, the General Manager, and our senior staff, remain with us. Of these seniors, the majority have between fifteen and thirty years' service with the Company. For them the duty of handling over at short notice to others what had been their life's work, can have been anything but pleasant. Faced with the necessity for plant inventories, stores valuations and lawsuits, all of a highly technical nature, the Company would have been in a sorry state without their assistance. They have stood by us in an admirable manner and I am sure we have correctly interpreted your wishes in promising them in return that they will be treated with consideration when the time comes for them to leave the Company's service."

Gas Undertakings' Results

Grangemouth.—Mr. T. A. Rowan, Engineer and Manager of the Grangemouth Gas Commissioners, in his report for the year ended May 15, states that industrial gas consumption decreased 15% compared with the previous year, and that domestic consumption increased by 9%. Work is in progress on a 12-in. gas main to the Newlands housing area. In the showroom gas appliances received under quote were insufficient to meet the prevailing demand. In the concluding part of his report, Mr. Rowan says: "The excellent returns wrested from inferior coal have surprised me and won the commendation of the Gas Engineering Advisory Board, and are directly due to the painstaking care of each man in performing his duties. Individually, collectively, and without exception, all have given loyal service, in a manner unique in my experience of the Gas Industry."

Holyhead and North Wales Gas and Water Corporation.—Gas sales for the year to March 31 totalled £186,959,200 cu.ft. Receipts from the sale of gas and residuals amounted to £70,166, against a total expenditure of £54,171 for manufacture and distribution. Net profit carried to appropriation account, subject to taxation, was £10,118. A dividend of 6%, less tax, has been declared, and £1,000 has been carried to reserve account.

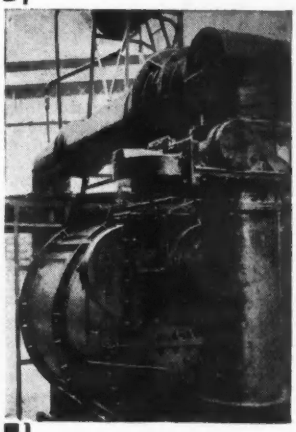
Lincoln.—In his report for the year ended March 31, 1945, Mr. George Wright, Engineer, states that gas production was 1,239,732,000 cu.ft., a decrease of 75,050,000 cu.ft. compared with the previous year. The decrease was accounted for by the strict fuel economy campaign carried out by industrial users, which was greatly appreciated by the Gas Department. Apart from a slight decrease in 1942, the output rose steadily throughout the previous ten years, the total for 1944 showing a net increase of nearly 75% over 1936. During the severe winter period the plant was working considerably above its recognized capacity, on occasions as much as 25%. Presenting the report to the Council, Alderman A. L. Bower, Chairman of the Gas Committee, said permission had been received for the installation of additional carbonizing plant, and the work was now in progress. The financial results were highly satisfactory, the gross profit being £53,439, and the net profit £33,344. Practically £18,000 had been given in rebate to ordinary consumers, equal to 15% of their accounts. The total amount of rebate given over the past four years was about £80,000. New meters, mains, sidings and locomotives, costing £18,884, had been paid for out of net revenue appropriation account, and there was now a gratifying balance of £104,235 on that account. Despite the increased cost of coal, the price of gas to domestic consumers was the same as in 1918, and was among the lowest in the country.

Lochgelly Gas Company.—At the 60th annual meeting a dividend of 4% less tax was declared. The chairman, Mr. A. Westwater, intimated that in the last ten years £22,000 had been spent on additions and repairs.

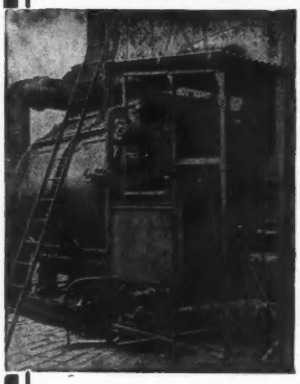
Manchester.—The annual report for the year ended March 31, 1945, records total gas sales of 8,073,411,000 cu.ft., a decrease of 256,783,000 cu.ft., or 3.08%, compared with the previous year. The decrease is mainly attributable to the reduced demand made by heavy industrial consumers and the Ministry of Fuel and Power restrictions, together with the effect of labour disputes. The domestic demand showed an upward tendency. The quantity of gas consumed for industrial and commercial purposes, mainly under special contracts and two-part tariff rates, was 3,884,703,000 cu.ft., or 48.12% of the total sales. Special contracts, including bulk supplies, are now in operation with 232 consumers. After appropriating £5,531 in respect of capital expenditure, the Gas Committee is carrying forward the balance remaining to the credit of the appropriation account; accordingly the reserves of the Department stand as follows: Appropriation of net profit account, £58,694; reserve fund account, £18,796; working capital fund account, £100,000; renewals account, £253,406; making a total of £430,896. Restrictions on supplies of appliances again adversely affected the expansion in the sales of domestic appliances, but the industrial and commercial sections have been busily engaged in advising and supplying under priority certificates gas apparatus for use in establishments concerned with the war effort.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

When a Joint leaks—



"Permac" Joints in a Gas Works.



"Permac" Joints in a Gas Works.

Consider the loss in output while the plant is shut down and the joint is being re-made.

"Permac" the original Metal-to-Metal Jointing makes leak-proof joints that last till you want to break them down. Stands up to all temperatures and pressures. Equally successful on steam, gas, water, oil joints.

Send for particulars

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METAL-TO-METAL JOINTING MATERIAL

Sole Manufacturers:

THOMAS & BISHOP LTD.
(formerly of 37, Tabernacle Street, London, E.C. 2)

Temporary address:
39, Arthur Road, Wimbledon Park, London, S.W. 19

Products Prices—Stocks and Shares

The London Market July 23.

There are no changes to report in the prices of Coal Tar Products.

As from March 5, by the Coal Tar Products Prices Order, 1945 (S. R. & O. 1945, No. 229), the maximum price of Pitch for briquetting has been increased to 60s. per ton f.o.r. supplying works, and the prices for Road Tar, as fixed by the Coal Tar Products Prices Order, 1943, S. R. & O. No. 1528, have been increased by one half-penny per gallon. There is also an increase of 5s. per ton in the price of standard Creosote/Pitch Mixture.

The only change to report in connexion with the prices of Coal Tar Products is the coming into effect on June 11 of a new Government Order increasing the prices of Coal Tar Spirits. This Order is entitled the Control of Benzole and Coal Spirit Order, 1945 (S. R. & O. 1945, No. 681).

Control of Toluene (No. 4) Order, 1944 (S. R. & O. 1944, No. 170), contains an amendment of the Control of Toluene (No. 3) Order, 1943.

Coal Tar Products Prices (No. 2) Order, 1944 (S. R. & O., 1944, No. 1051), allows increases in the maximum prices for all forms of Naphthalene.

The Provinces July 23.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's. 2s. 4d. to 2s. 6½d., pure, 3s. 2½d. (now controlled by S. R. & O. 1945, No. 681), operative from June 11, 1945. Benzole and Coal Spirit, also Coal Tar Naphtha and Xylole, are now controlled by the Control of Benzole and Coal Spirit Order, 1945, dated June 1, 1945, S. R. & O. 1945, No. 681, operative from June 11, 1945. Carbolic acid, 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil controlled by the Coal Tar Products Prices Order, 1943, dated Oct. 20, 1943 (S. R. & O. 1943, No. 1528), operative from Nov. 15, 1943, Naphthalene now controlled under S. R. & O. 1944, No. 1051, operative from Sept. 22, 1944.

Attention is called to Coal Tar Products Prices Order, 1945 (S. R. & O. 1945, No. 229), referred to on p. 305, "JOURNAL" of March 7.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Scotland July 21.

Local holidays have curtailed deliveries. Refined tar:* Yield to Distillers is 5d. per gallon *ex* works, naked. Creosote oil: Timber preserving quality,* 5½d. to 6½d.; hydrogenation oil,* 5¾d.; low gravity or virgin oil,† 7½d. to 7¾d.; benzole absorbing oil,* 6½d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha†: 7d. to 8d. per gallon. Solvent naphtha*: Basic prices delivered in bulk, 90/160 grade, 2s. 10d., and 90/190 Heavy naphtha, Unrectified, 2s. 0½d.; Rectified, 2s. 4d. per gallon. Pyridine†: 90/160 grade 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

The volume of business in the stock markets was appreciably smaller than the previous week. A feature, however, was the strength of industrial shares, many being marked up twice the amount of their loss the week before. It is evident that a general shortage of stock exists and any small purchasing movement is sufficient to send up prices.

The Gas Market was no exception to the general trend and less business was recorded. Prices continue firm and it will be seen below that very few changes occurred. A feature was the continued strength of Montevideo stock which has been steadily hardening for some time and closed 7½ points higher.

The following price movements were recorded during the week:

OFFICIAL LIST

Alliance & Dublin Ord.	112—117	−1	
Cardiff Ord. (*x.d.*)	124—129	July 16	
Gas Light Units	22/9—23/9	+−/3d.	
Ditto 3½ p.c. max.	82—85	+½	
Ditto 3½ p.c. Red. Pref. (*x.d.*) ...	101—104	July 16	
Montevideo Ord.	102—107	+7½	
Oriental	170—175	+3	
Primitiva Holdings 6 p.c. Red. Cum. Pref.	102—107	+3	
South-Eastern Gas Corporation Ord.	21/6—22/6	−−/3d.	
South Metropolitan 5 p.c. Red. Deb. (*x.d.*)	102—107	July 16	

TRADE CARDS

FULL particulars of these spaces can be obtained on application to the Publishers. They are designed principally for the use of the firms whose display advertisements cannot be included owing to paper rationing.

Arkon
INSTRUMENTS
Gas Flow Recorders and Indicators
Pressure and Vacuum Recorders and Indicators
Full Scale or Inclined Gauges
WALKER, CROSWELLER & CO. LTD.
CHELTENHAM, GLOS. Cheltenham 5172

GRIFFITHS BROS. & CO. LTD.
Mack's Road, Bermondsey, London, S.E. 16. T/N BERmondsey 1151. T/A London Aquol Phone, London.
Paint, Enamel and Insulating Varnish Specialists. "FERRODOR" Metal Protection for protecting Gasholders and other Structural Works from the ravages of Corrosion.

M. B. WILD & CO. LTD.
Mechanical Engineers, Argyle Street, Birmingham 7. T/N East 0472.
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We Specialise in . .

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COLLIERY AGENTS, SHIPPERS and CONTRACTORS

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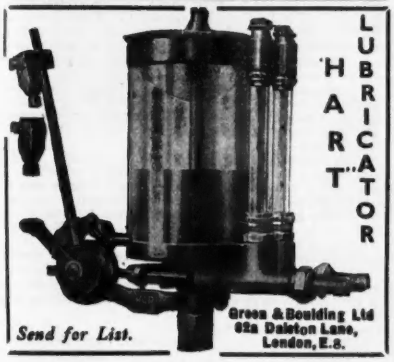
Telegrams: "Purification, Stock, London." Telephone: London Wall 5077



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MANUFACTURERS of Gas-holders, Tanks, Condensers, Purifiers, Scrubbers, Washers, and every description of Gas Plant.

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ROBERT DEMPSTER & SONS, LTD., ELLAND, Builders of CARBONIZING PLANTS, both Horizontal and Vertical. Manufacturers of CONDENSERS, PURIFIERS, GAS-HOLDERS, &c., also every description of COAL and COKE HANDLING PLANT. *Telegrams:* "Dempster, Elland." *Telephone:* Elland 2241, 2242 and 2243.

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T.I.G.B. Students have gained 29 FIRST PLACES and Hundreds of Passes in the Examinations for A.M.Inst.C.E., A.M.I.Gas E., A.M.I.Chem.E., A.M.I.Mech.E., A.M.I.E.E., C. & G., etc.

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The Department of Fuel Technology covers **Gas Supply, Gas Engineering, Gas Power, Engineering,** and the **Certificates of The Institution of Gas Engineers.**

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FOR SALE.—Cylindrical Receiver 30 ft. by 7 ft. dia.; 100 lb.; Cornish Boiler, 3,300 lb., evaporation 140 lb. w.p.; Weir Feed Pump 8¼ in. by 6 in. by 13 in.; Weir Feed Pumps (2) 5 in. by 3 in. by 6 in.; Weir Service Pump 6,300 g.p.h.; 7 h.p., 25 h.p., and 40 h.p. Crossley Gas Engines; Tangye 3-Throw Ram Pump 5 in. by 8 in.

HARRY H. GARDAM & CO., LTD., STAINES.

FOR DISPOSAL.—Iron work for 5 Horizontal Beds of Retorts including Mouth Pieces, 22 in. by 16 in. section, Ascension Pipes, Arch Pipes, Hydraulic Mains, Tar Mains, 2 Retort House Governors with all necessary valves and connexions.

Apply Mr. W. H. Battersby, M.I.Gas E., M.I.Chem.E., Engineer and General Manager, Bury Corporation Gas-Works, Victoria Street, Elton, Bury.

CONTRACTS OPEN

THE Severn Valley Gas Corporation, Ltd., invite TENDERS for a HIGH PRESSURE GAS-HOLDER for the Monmouth Gas-Works, to store 50,000 cu.ft. at 60 lb. per sq.in. Higher pressures for the same quantity would be considered. The vessel can be of any shape to suit the builders. It will have to conform to requirements of the Engineering Insurance Companies. Enquiries are also invited for suitable COMPRESSING PLANT of 5,000-10,000 cu.ft. per hour. Electricity supply: 400 v., 3 ph., 50 cycles.

Queries respecting the above can be addressed to the Severn Valley Gas Corporation, Ltd., Gas-Works, Cheltenham, or to A. E. Pask, Engineer, The Gas-Works, Monmouth.

NEWBURY CORPORATION GAS UNDERTAKING

THE Newbury Corporation invite Tenders for the supply and erection of one GAS HOLDER, capacity 750,000 cubic feet. Further details, and a copy of the general Specification, can be obtained from the undersigned, to whom Tenders in a sealed envelope, endorsed "Tender: Gas Holder," should be delivered on or before August 14, 1945.

Municipal Buildings, Newbury, Berks. S. WIDDICOMBE, Town Clerk.

APPOINTMENTS VACANT

None of the situations advertised in these columns relates to a man between the ages of 18 and 50 inclusive or a woman between the ages of 18 and 40 inclusive, unless he or she is excepted from the provisions of the Control of Engagement Order, 1945, or the vacancy is for employment excepted from the provisions of that Order.

(Passed to Appointments Board by Ministry of Labour and Approved.)

THE LIVERPOOL GAS COMPANY

THE Liverpool Gas Company require the services of a suitably qualified person to take charge of the inspection of stores and equipment, including gas appliances, in connection with their centralized Stores Department. Applicants should be qualified by training and experience in Physics and/or Chemistry and/or Mechanics, and should preferably be not more than 35 years of age.

The salary will be in accordance with qualifications, and would not be less than £450 per annum, inclusive of the current cost of living bonus.

The successful applicant will be required to pass the usual pre-employment medical examination, and will be admissible to the Officials' Superannuation Fund.

Applications should be made on the official form, which may be obtained by writing to the Personnel Superintendent, Radiant House, Bold Street, Liverpool, 1, and should be returned to him in order to arrive on or before July 28, 1945.

WANTED.—PUBLIC LIGHTING INSPECTOR to supervise maintenance, &c., of 2,200 Public Lamps. Wage according to qualifications.

Apply, stating Age, Experience, Wage required and position under Essential Works Order to Manager, East Hull Gas Company, St. Mark Street, Hull.

WANTED.—DRAUGHTSMEN with initiative, experienced in the designing and detailing of Gas-Works Plant also Mechanical Handling Plant. Applications, which will be treated in confidence, should state Age, Experience and Salary required to No. 9452, "GAS JOURNAL," 51, High Street, Esher, Surrey.

(Classified Advertisements continued on p. 142)

APPOINTMENTS VACANT (ctd.)

The Ministry of Labour and National Service have given permission under the Control of Engagement Order, 1945, for the advertisement of this vacancy.

THE LIVERPOOL GAS COMPANY

MAINS SUPERVISOR

APPLICATIONS are invited for a Position of DISTRICT MAINS SUPERVISOR in the Distributing Department of The Liverpool Gas Company. Applicants should not be more than 45 years of age and should have a sound technical and practical training on all aspects of gas distributing problems, with particular reference to mains, services, low and high pressure gas, district governor operation and maintenance.

Application forms may be obtained by writing to the Personnel Superintendent, Radiant House, Bold Street, Liverpool, 1, and should be returned to him on or before July 31, 1945.

The Salary would be £400 per annum inclusive of the current cost of living bonus, and the successful applicant would be required to pass the usual pre-employment medical examination, and would be admissible to the Officials' Superannuation Fund.

DERBY GAS LIGHT & COKE COMPANY

APPOINTMENT OF SHIFT FOREMEN

APPLICATIONS are invited for the position of SHIFT FOREMEN to work on rotating shifts with intervals on day work as Deputy Yard Foremen.

Applicants should be Gas-Works trained and have had good experience in Retort House Control and Works routine, and must possess ability satisfactorily to control labour. Present wage £7 per week.

The appointment will be terminable by one month's notice on either side, and successful candidate will be required to pass a Medical Examination.

Candidates should state the period of notice required to terminate their present appointment, and position in regard to Military Service and Essential Works Order.

Applications, stating Age, Experience, and present position, and enclosing *copies* of two recent Testimonials, should be addressed to the undersigned to be received not later than August 15, 1945.

Gas Offices, Friar Gate, Derby. C. H. MOSEDALE, Secretary.

YORK, HARROGATE & DISTRICT GROUP OF GAS COMPANIES

HOME Service Adviser required to take charge of the Home Service Department of the above Group of Gas Companies.

Demonstration qualifications are desirable, but organizing ability is essential.

Applications (indicating salary required—which will be paid according to qualifications and experience) should be forwarded to the undersigned (together with *copies* of not more than three Testimonials) for receipt not later than first post Monday, August 12, 1945.

48, James Street, Harrogate. CHARLES BATEMAN, General Manager.

CITY OF LINCOLN

(GAS DEPARTMENT)

TWO APPLIANCE FITTERS wanted. Permanency and good prospects for suitable men.

Applications (stating Age, Experience, and position regarding Essential Works Order) to :

Gas Offices, Silver Street, Lincoln. July 20, 1945. GEO. WRIGHT, M.I.M.E., M.I.G.E., M.I.B.E., M.I.W.E. Engineer and Manager.

A VACANCY exists on a machine charged horizontal plant in the Midlands for a WORKS MAINTENANCE FITTER/MECHANIC. Applicants must possess a knowledge of electric motors switch gear, &c., and be competent to keep all machinery pumps, &c., in first class order. Wages £6 10s. per week, including war bonus.

Apply, giving full particulars of Experience, together with *copies* of References and position under E.W.O., to No. 9454, "GAS JOURNAL," 51, High Street, Esher, Surrey.

SKELMERSDALE URBAN DISTRICT COUNCIL

(GAS AND WATER DEPARTMENT)

APPLICATIONS are invited for the position of ENGINEER AND MANAGER of the Council's Gas Undertaking and Water Department.

Candidates must be qualified persons with a sound technical knowledge of a Gas and Water Undertaking and with good commercial experience.

The appointment will be subject to the Local Government Superannuation Act, 1937, and the person appointed will be required to pass a Medical Examination.

The salary will be £325 per annum, rising by annual increments of £15 to a maximum of £355 per annum, subject to satisfactory service, plus cost of living bonus, at present £59 16s.

Applications endorsed "Gas and Water Engineer," stating Age, Qualifications and Experience, together with *copies* of not more than three recent Testimonials, should reach the undersigned not later than the first post on Wednesday, August 8, 1945.

Town Hall, Skelmersdale, Lancs. July, 1945. E. S. ROSBOTHAM, Clerk of the Council.

BOROUGH OF LOUGHBOROUGH

(GAS DEPARTMENT)

ASSISTANT ENGINEER

APPLICATIONS are invited for the Position of ASSISTANT ENGINEER to the above Undertaking, at a commencing salary of £325 per annum rising, subject to satisfactory service, by yearly increments of £15 to £370 per annum, plus cost of living bonus, which is at present £59 16s.

Candidates must be qualified Engineers, holding the Higher Grade Gas Engineering Certificate, and have a thorough knowledge of and experience in the control of Gas-Works plant, including Vertical Retort Installations (preferably Woodall-Duckham).

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications, stating Age, Experience and Qualifications, together with information as to the position in relation to the National Service Acts and Essential Works Order, and *copies* of two recent Testimonials, must reach the undersigned not later than August 7, 1945. Envelopes should be endorsed "Assistant Gas Engineer."

Town Hall, Loughborough. July 18, 1945. A. GWYNNE DAVIES, Town Clerk.

THE Cape Town and District Gas Light & Coke Company, Ltd., invite applications for the position of CHIEF ENGINEER at its Cape Town Works, with the prospect of eventual succession to the position of General Manager and Engineer. Applicants, preferably, should be under 35 years of age, with experience of vertical retorts working, water gas manufacture, general maintenance of works, plant, mains, &c., handling of labour and with a knowledge of administration. Present output 350 millions. Basic commencing salary £1,000 per annum, plus cost of living allowance and car. The effective rate of Union income tax at present is about 2s. per pound sterling.

Applicants are required to furnish details of training, experience, present position held, with Testimonials (*copies*), and to state their position under the Essential Works Order. The successful applicant will be required to enter into an agreement of service for 5 years, and first-class passage out and home will be provided by the Company. Applications should reach the Managing Director of the Company by post not later than August 7, 1945, at Africa House, Kingsway, W.C. 2.

By Order of the Board, A. BLACKBURN, Secretary.

The Ministry of Labour and National Service have given permission under the Control of Engagement Order, 1945, for the advertisement of this vacancy.

A LEADING Firm of Contractors has a vacancy on their Technical Staff for a CARBONIZING ENGINEER, fully conversant with the design, building and operation of Horizontal and Vertical Retorts. Good prospects assured for a suitable applicant. State Age, Experience, and Salary required to No. 9453, "GAS JOURNAL," 51, High Street, Esher, Surrey.

CITY OF COVENTRY GAS DEPARTMENT

DRAUGHTSMAN

APPLICATIONS are invited for the position of DRAUGHTSMAN with the above Undertaking. The salary grade will be £260 rising to a maximum of £350 per annum by increments of £15, subject to satisfactory service (commencing salary in conformity with experience); plus cost of living bonus, at present £59 16s. per annum.

Applicants must have previous experience of gas plant design and structural work, also be capable of taking out quantities and preparing specifications.

The successful applicant will be required to pass satisfactorily a medical examination and to contribute on a statutory basis to the superannuation fund under the Superannuation Acts, as amended in regard to annuities to widows by the Coventry Corporation Act, 1936. He will also be required to contribute to the Staff Widows' and Orphans Pension Scheme.

Applications, stating Age, Experience, and Qualifications, together with position in relation to National Service Acts and Essential Works Order, and with *copies* of two recent Testimonials, should be received not later than August 9, 1945.

Gas Department Offices, Hill Street, Coventry. Engineer and General Manager.

CITY OF COVENTRY

(GAS DEPARTMENT)

TECHNICAL ASSISTANT—DISTRIBUTION DEPARTMENT

APPLICATIONS are invited for the Position of TECHNICAL ASSISTANT in the Distribution Department of the above Undertaking. The salary grade will be £260 rising to a maximum of £350 per annum by increments of £15, subject to satisfactory service (commencing salary in conformity with experience), plus cost of living bonus, at present £59 16s. per annum.

Applicants must have a thorough technical knowledge and experience of high and low pressure distribution and to be competent draughtsmen capable of preparing drawings and estimates as required in the Distribution Department.

The successful applicant will be required to pass satisfactorily a medical examination and to contribute on a statutory basis to the superannuation fund under the Superannuation Acts, as amended in regard to annuities to widows by the Coventry Corporation Act, 1936. He will also be required to contribute to the Staff Widows' and Orphans' Pension Scheme.

Applications, stating Age, Experience, and Qualifications, together with position in relation to National Service Acts and Essential Works Order, and with *copies* of two recent Testimonials, should be received not later than August 9, 1945.

Gas Department Offices, Hill Street, Coventry. Engineer and General Manager.

STRETFORD & DISTRICT GAS BOARD

APPOINTMENT OF ENGINEER, GENERAL MANAGER AND CLERK

THE Board invites applications for the appointment of ENGINEER, GENERAL MANAGER AND CLERK, shortly to become vacant, at a commencing salary of £2,000 per annum (plus temporary cost of living bonus, £36 per annum).

Applicants must be duly qualified Engineers, possessing suitable Technical and Administration qualifications. The person appointed will be required to devote the whole of his time to the duties of the office.

The appointment will be determinable by three months' notice on either side, and is subject to the provisions of the Local Government Superannuation Act, 1937. The selected candidate will be required to pass a medical examination.

Applications, stating Age, Qualifications, present appointment and duties, and full details of experience, must be addressed to the Chairman of the Board, accompanied by not more than three recent Testimonials, not later than Friday, August 10, 1945.

Gas Works, Longford Road, Stretford. JAMES CARR, Engineer, General Manager and Clerk.

July 20, 1945.

FOUNDED 1850
HOLMES
HUDDERSFIELD

ELECTRICAL DETARRERS

82

Precipitation Plants in operation or under construction.

These include over

60

"Holmes-Elex" Patent Electrical Detarrers

SOUND BASIC PRINCIPLES of design and construction are a distinguishing feature of all Holmes' products. This is again evident from the efficient operation of "Holmes-Elex" Precipitators.

PARALLEL PLATE PRECIPITATION ELECTRODES are the basis of construction of all our plants since the first one built in 1935.

This principle is now being generally adopted as the most satisfactory construction from all points of view.

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Telephones: Huddersfield, 5280 : LONDON, Victoria, 9971 : BIRMINGHAM, Midland, 6830

C241

Protection—

The Hermit Crab is literally "a poor fish," and for all we know, he may be responsible for the coining of that well-known phrase. Apparently he has neither brains nor—to put it vulgarly—guts! Else how could he be content with somebody's discarded abode as his lodging? Nevertheless, this "discarded" abode becomes his only protection (and a very efficient one) against the rigours of the elements and against his natural enemies. And this brings us to the point of this short narration . . . you must have protection and that protection must be efficient. Obviously, then—

HERMIT CRAB. A variety of crab that lives in mollusc's cast-off shell to protect its shell-less hinder parts.

your protection is the

'A & M' METER

ALDER & MACKAY LTD., NEW GRANGE WORKS, EDINBURGH, 11

STATIC WASHERS

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AMMONIA AND BENZOL EXTRACTION

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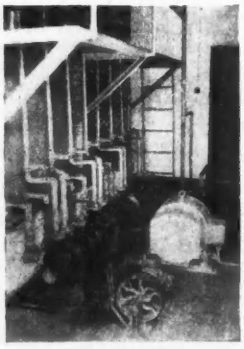

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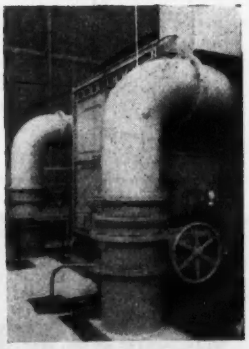
(*b*) Tar Fog Extraction by High-Speed Sprays.

(*c*) Strength Liquor with Minimum Water or Weak Liquor Supply.



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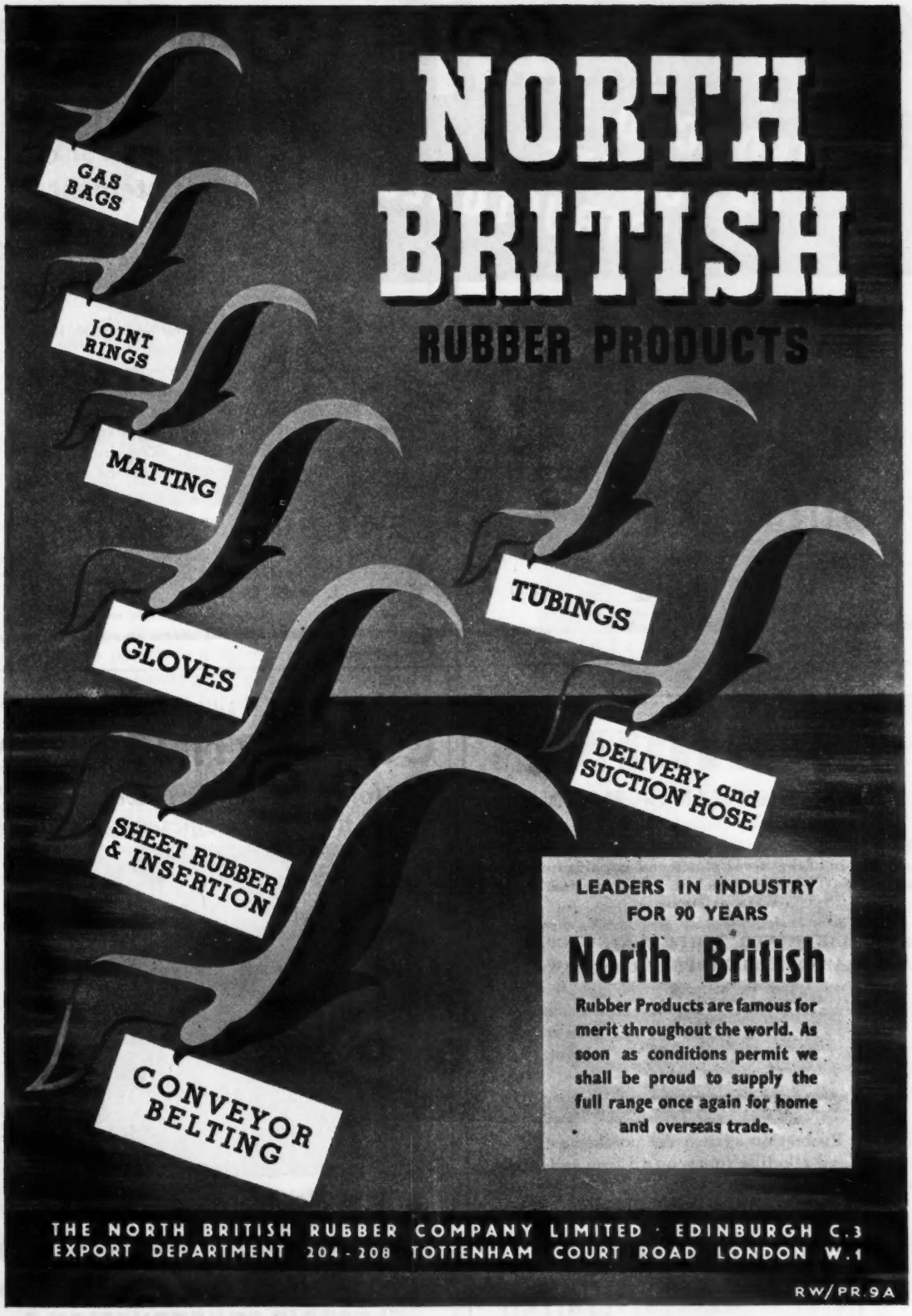
Grams: Washer, Estrand, London.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Rubber Products are famous for merit throughout the world. As soon as conditions permit we shall be proud to supply the full range once again for home and overseas trade.
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The Services of Specialists are needed in this important work of reinstatement

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The reinstatement of such plant forms part of the specialised work of Quickset Water Sealers Ltd. Their unique experience not only ensures that the right type of materials are used, but that highly skilled men apply them by methods which have been proved to be entirely efficient.

The Company is prepared to investigate any defective structure, make recommendations and supply the most suitable compounds for the necessary remedial measures, or submit a quotation for carrying out such work. Enquiries from executives of the Gas Industry are invited.

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(FORMERLY SIKA-FRANCOIS LTD.)

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Telephone: ABBey 1371/2/3 *Telegrams: Abbey 1371*

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NON-SETTING PAINT

Used by the leading Gas Companies for the protection of the lower plates and cuppings of gas-holders. The most efficient anti-corrosion paint in existence

HUMIDINE NEVER* DRIES, NEVER CRACKS AND IS ABSOLUTELY IMPERVIOUS TO WATER

OXY-GRAFITE PAINT

For the Protection against the corrosive effects of acid and alkaline fumes on all iron and steel-work of gasworks, Aspinalls Oxy-Grafite Paint is unsurpassable

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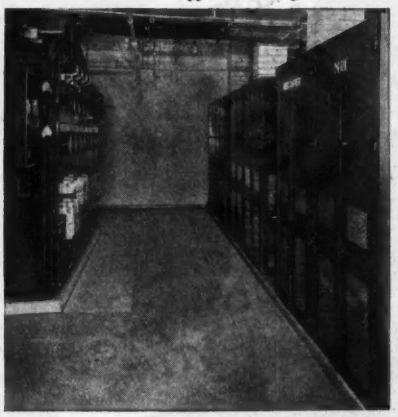
CONVERTING PLANT

for Gas Works power supply giving maximum efficiency at all loads

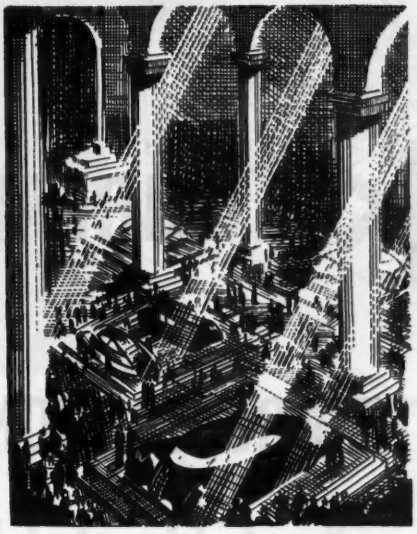


Three double-bulb balancer sets for power and lighting supply, complete with DC distribution panel

Input: 440 volts, three-phase 50 cycles
Output: 250/0/250 volts, 200 amp. per set

The **ELECTRIC CONSTRUCTION Co.** Ltd.
WOLVERHAMPTON

SEEING LIFE AGAIN IN IT'S TRUE 'COLOURS'



The near future Motor Show

All over the world there is a longing for a return to peacetime brightness. Manufacturers, realising this, are planning to give their products a bigger measure of bright and attractive colours than ever before. The next Motor Show, for example, will be the most attractive in living memory, a kaleidoscope of colour.

Whether or not your particular activities are in the Motor Trade, Aeraspray Equipment and the Aeraspray Method of Industrial Spraying can play an integral part in your Post-War Drive for Home and Overseas business—from start to finish . . . especially "finish."

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SYSTEM OF INDUSTRIAL SPRAY FINISHING

MAKERS OF PORTABLES, SPRAY GUNS, BOOTHS, DUCTING COMPRESSORS, AUTOMATICS, FANS, HOSE, AIR RECTIFIERS

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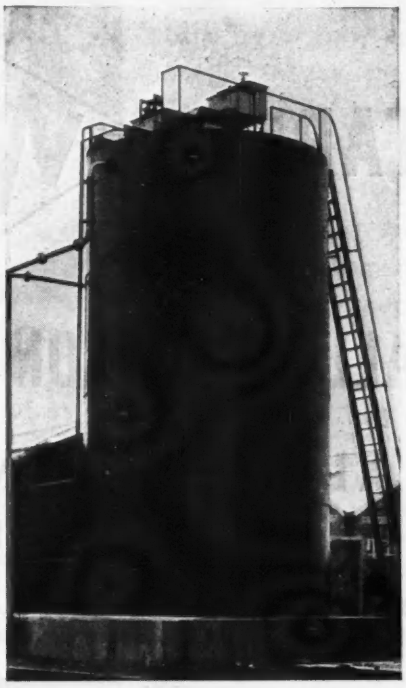
179-213 THIMBLE MILL LANE, BIRMINGHAM, 7. Also at MANCHESTER, BELFAST, ETC.

STABILIZED LIME SOFTENING



Filtrol Lime-Soda Water Softening Plant treating 4,500 galls./hr. for boiler feed.

★ **Our latest lime-soda and lime-zeolite water softening plants for boiler feed incorporate our special stabilization process for the control of alkalinity to prevent after-precipitation and caustic embrittlement. Technical literature available on request.** ★

Also : Filtrol base exchange water softening plant : Continuous blowdown equipment : Filtrator colloidal process—feed-water conditioning, and prevention of oxygen corrosion in high-pressure boilers : Electrical de-oiling plant : Filtration plant : Chemical dosing gear : Chlorinating equipment : etc.

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Full details from:

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TO ENSURE PRESSURE-TIGHT JOINTS

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MALLEABLE IRON PIPE FITTINGS & UNIONS

Made by

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Grams: "Malleable" Keighley. **Phone: Keighley 3749 (2 lines)**

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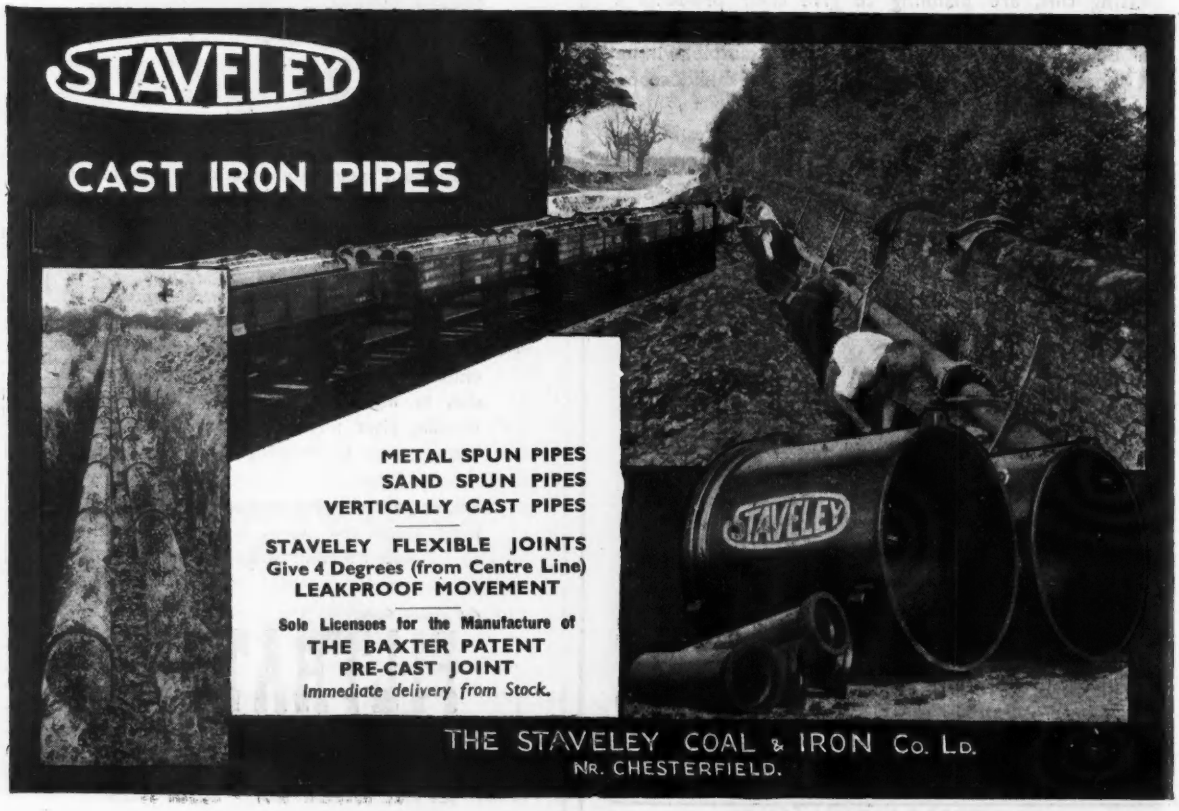

METAL SPUN PIPES
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STAVELEY FLEXIBLE JOINTS
Give 4 Degrees (from Centre Line)
LEAKPROOF MOVEMENT

Sole Licensees for the Manufacture of
THE BAXTER PATENT
PRE-CAST JOINT
Immediate delivery from Stock.

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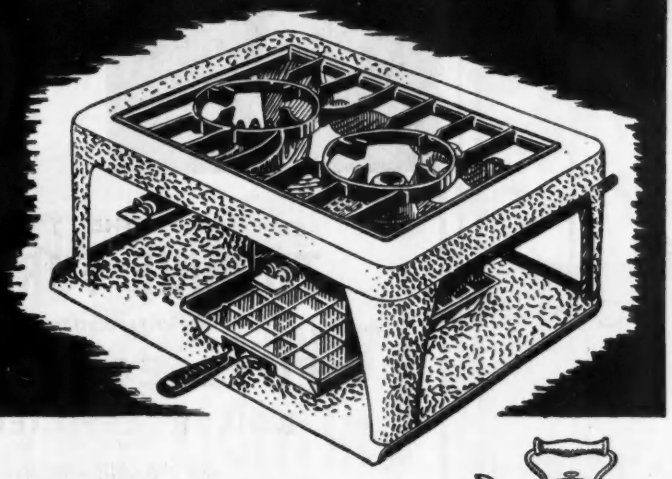
Efficient! Economical!! Exclusive!!!



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Argyll Hotplates boil, grill, toast, fry or stew economically. They are the only range of Hotplates which incorporate the famous "DUEX" Grill-Boil Burner. A "high-speed" boiling, also "simmering," burner in the upright position and the most efficient grill when reversed.

The "DUEX" Grill-Boil Burner

It Grills . . .

. . . and Boils

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FALKS FALK, STADELMANN & CO., LTD., LONDON & BRANCHES

89–12

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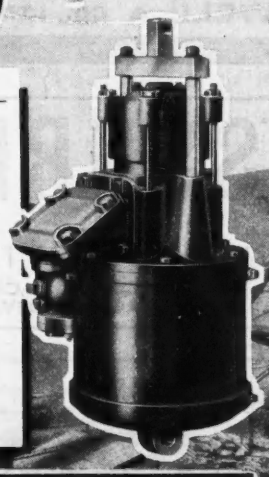
A.C. FLAMEPROOF **THRUSTOR**

Two- or Three-phase up to 650 volts

Applications include:—
BRAKES
LATCHES
CONTROL VALVES
GATES
SLIDING DOORS
HOISTS
TRANSFER MECHANISMS ON CONVEYORS
or
wherever a brake magnet or lever mechanism is at present employed



Outputs:—
FROM 150 lb. Thrust 3 ins. Stroke TO 800 lb. Thrust 8 ins. Stroke

Exerts a smooth straight-line constant-pressure thrust throughout full stroke, without shock or jar.

For Coal Mines, Gas Works, Oil Refineries, Paint and Varnish Factories, or any situation where inflammable gas or vapour may be present.

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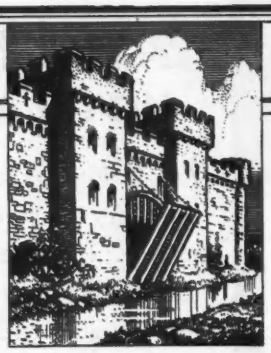

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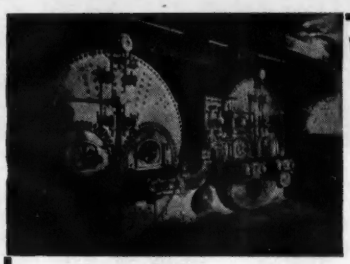
GAUNTLET

GAUNTLET

WEATHER TESTED PAINTS

ARCHD H. HAMILTON & CO. LTD

27-37 BARDOWIE STREET POSSILPARK GLASGOW. N



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TURBINE FURNACE

has a reputation for

FUEL ECONOMY

BOILER EFFICIENCY

and the ability to give

LARGE STEAM OUTPUT

with

ALL CLASSES OF FUEL

THE TURBINE FURNACE Co. Ltd.
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ERECTION WORK

GAS HOLDERS. OIL TANKS. STEEL BUILDINGS. CAST IRON TANKS. PURIFIERS. MAIN LAYING. PAINTING.
Sub-Contractors for any Erection Work,
REPAIRS, RE-SHEETING, DISMANTLING, & RE-ERECTION INSPECTIONS.

S. CROOKSTON & CO.

Contractors
GREATWORTH, BANBURY, OXON.

COMPRESSORS & EXHAUSTERS

FOR AIR AND GAS.

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UNDERPRESSURE CONNECTIONS, SPLIT COLLARS, SOCKET CLIPS

UNDERPRESSURE

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UNION FOUNDRY, MANSFIELD, NOTTS.

Be Sure and Safe by using OUR PATENT "SAFETY" { C.I. TEES, PLUG CAPS Main BAGGING DEVICE

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WEST GORTON WORKS, LTD.

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STREET LIGHTING that is better and cheaper

In many districts the pressure on existing gas mains will have to be raised because of the increasing demand. This higher pressure will not affect Street Lamps adversely, for if these are fitted with Peebles Street Lamp Governors the pressure and volume *at* burners can be adjusted to suit the burners. This will result in maximum *light* for minimum *gas* consumption.

Fair-sized towns can reduce their lighting costs hundreds of pounds yearly by fitting

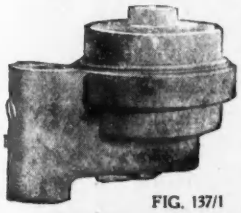

FIG. 137/1

Peebles

STREET LAMP GOVERNORS

Samples and Prices on request Prompt Deliveries

PEEBLES & CO. LTD., TAY WORKS, BONNINGTON, EDINBURGH

Telephone: LEITH 36544 *Telegrams:* Tangent, Edinburgh

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Gunite is PROTECTION against abrasion

Gunite—concrete applied by air pressure—has numerous applications where its great density and extreme adhesion have particular value.

For lining coal bunkers and steel chimneys it is an ideal material, possessing great resistance to corrosion and protecting steel-work from the abrasive action of the raw coal.

For repairing reinforced concrete it has particular merit, as, due to the method of application, a uniform density and adherence is obtained in whatever place the Gunite is applied, thus overcoming the common fault with hand-placed methods.

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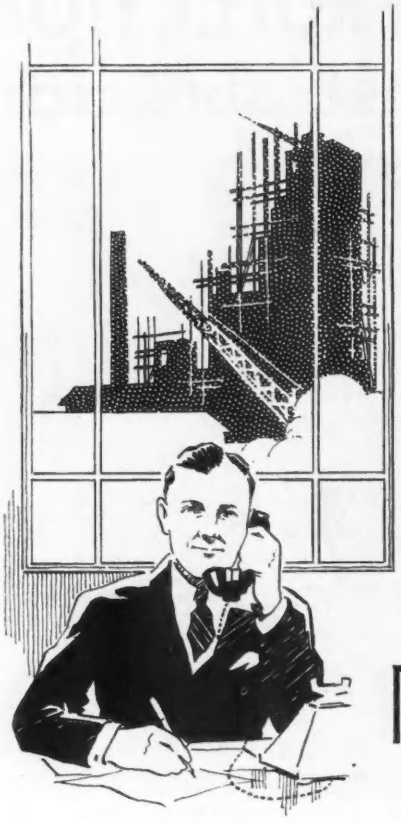
'Phone: Victoria 7877 & 6275

'Grams: Prufcrete, Phone, London

View of Vertical Retort House at Market Harborough, erected by Drakes Limited



PERFORMANCE
backs every promise

THE term "dependability" has distinguished Drakes' performance throughout the long years of development in the Gas Industry.

To meet the many problems imposed by progress, Drakes' technicians are ready with the right solution; while Drakes' vast resources ensure completion in detail. And Carbonising Installations by Drakes Limited are renowned for quick response to unusual demands, and maximum output with minimum maintenance costs.

Telephone : Halifax 4701 P.B.Ex.
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LIMITED · HALIFAX · YORKS

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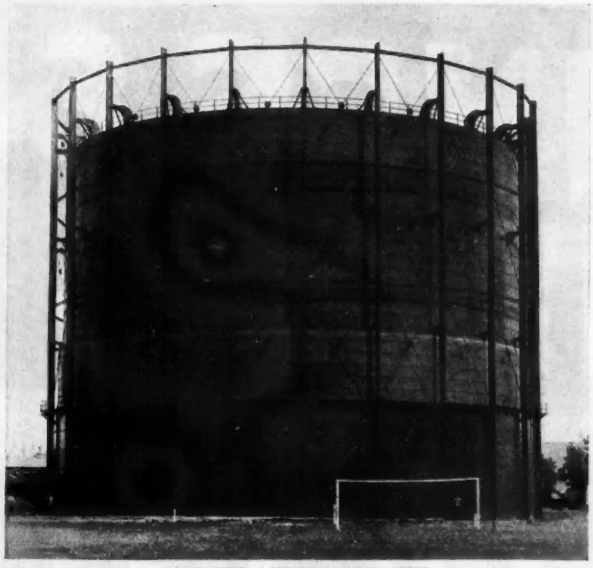
SPECIAL Shapes

"BLUEBELL"
95% Silica Brick

is designed for Maximum Resistance to Abrasion and Corrosion combined with Volume Stability and Accuracy of Shape. Technical control in manufacture ensures a uniform Reliable Standard and it is recommended with confidence for Vertical and Horizontal Retort Settings.

STEIN Refractories

JOHN G. STEIN & CO. LTD. BONNYBRIDGE. SCOTLAND



CAPACITY, 1,200,000 CUBIC FEET.

GAS HOLDERS

GUIDE-FRAMED
AND
SPIRAL GUIDED
WITH OR WITHOUT
STEEL TANKS.

WATERLESS (KLÖNNE) GASHOLDERS.

HIGH PRESSURE GASHOLDERS
CYLINDRICAL OR SPHERICAL.

RIVETED OR ELECTRICALLY WELDED.

R. S. J. GUIDE-FRAMING AS CONSTRUCTED BY C. & W. WALKER, LTD., IS SIMPLE IN CONSTRUCTION AND ECONOMICAL IN MAINTENANCE.

C. & W. WALKER, LTD.

DONNINGTON,
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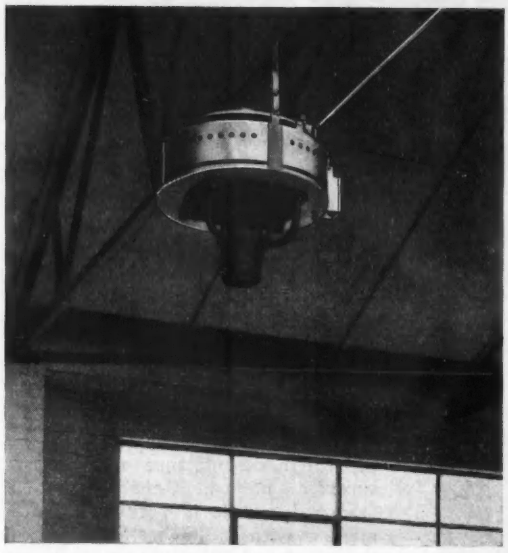
'Grams: "Fortress," Donnington, Shropshire

LONDON OFFICE—Temporary Address: DONNINGTON, WELLINGTON, SHROPSHIRE.

THE "KEITH-BLACKMAN" GAS-FIRED UNIT HEATER



This is the latest "KEITH BLACKMAN" Gas-fired Unit Heater for warming Workshops, Factories, Garages, Offices, Stores, etc., and drying. It consists of screen-protected gas burners combined with a special electric air circulating fan, and it discharges warm air with a rotatory effect.

No steam, drain or hot water piping, or boilers, are required—just a supply of gas at ordinary town's pressure and electrical energy to drive the fan motor.

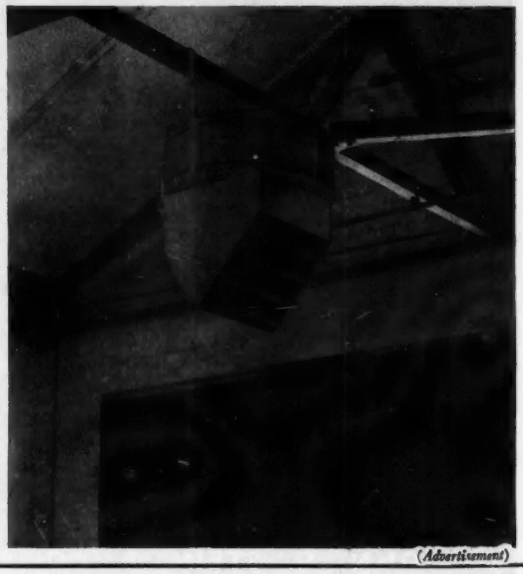
The Unit is arranged for overhead suspension at heights up to 14 ft., and its directly effective area at 14 ft. is that given by a circle approximately 25 ft. diam.

For corner positions or other situations where a circular distribution of air is inconvenient, this Unit can be supplied with a louvred casing as shown in the illustration below, which louvred casing can be twisted to throw the warm air in the direction desired.

Gas consumption: one therm an hour; electricity consumption: only 150 watts.

In warm weather this Unit can be used as an air circulator to improve ventilation conditions.

If you are interested, write for Catalogue V-181, to Keith Blackman, Ltd., Mill Mead Road, London, N. 17; or 'phone Tottenham 4522 or wire "Keithblac, Phone, London."



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PACKINGS & JOINTINGS

• WE SOLVE MODERN PACKING & JOINTING PROBLEMS — IT IS OUR SOLE BUSINESS •

JAMES WALKER & Co. LTD.

"LION" WORKS, WOKING, SURREY, ENGLAND.
Phone: WOKING 2432 'Grams: "LIONCELLE."

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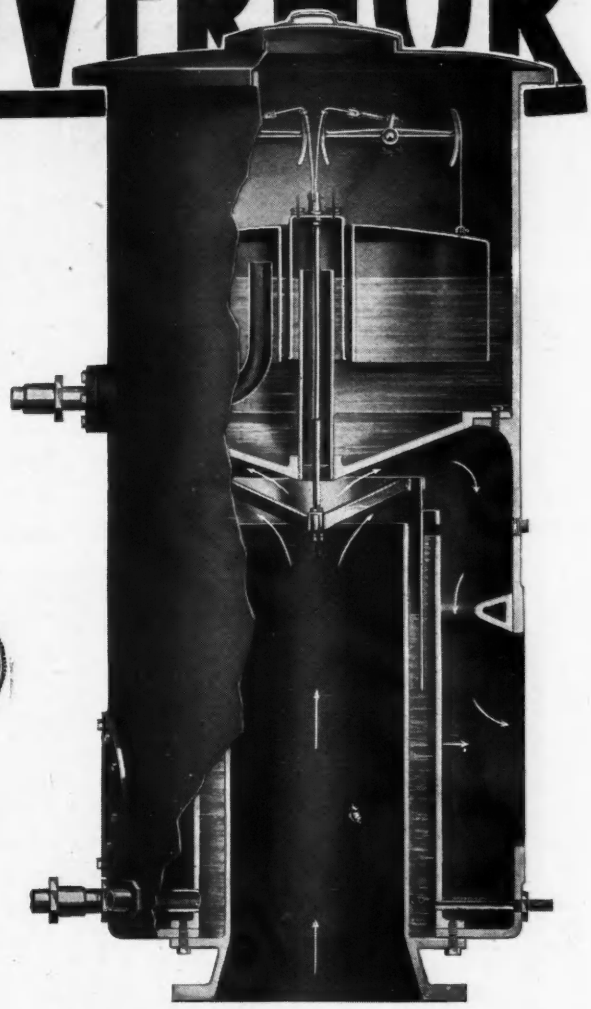
B-K VACUUM GOVERNOR

Patent No. 395,443

SENSITIVE RETORT HOUSE GOVERNING WITHOUT 'RELAY'



- Reduction of inertia in working parts.
- Direction of tar deposition.
- Complete dust-proof enclosure.

PLEASE WRITE FOR OUR BROCHURE

W.&B.COWAN

INCORPORATED IN PARKINSON & COWAN (GAS METERS) LTD.

FITZALAN STREET WORKS, KENNINGTON RD., LONDON, S.E.11; also at GLASGOW NEWCASTLE-ON-TYNE AND MANCHESTER

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REG. TRADE MARK

BRONZOID
Arc Welding Electrodes

For repair work on Bronze, Brass and light section Cast Iron.
Backed by over 30 years intensive development and unrivalled technical service.

THE QUASI-ARC COMPANY LTD · BILSTON - STAFFORDSHIRE

Pulsometer
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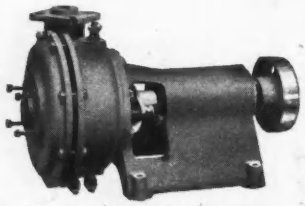
PUMPS FOR GAS WORKS

The Pulsometer Engineering Co. have for many years supplied pumps of many types to meet the varied duties required in modern Gas Works. These include a wide range of standard centrifugal designs for general water supply and cooling water services for clean water, and specialized pumps constructed in the metal most suitable for pumping the various special liquors met with in the recovery of by-products.



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For Mother Liquors containing acids, the Pulsometer-Doulton Stoneware Pump can resist all but hydrofluoric acid and is suitable for temperatures up to 100° C.

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Pulsometer Engineering C° L^td^.
Nine Elms Ironworks. Reading.

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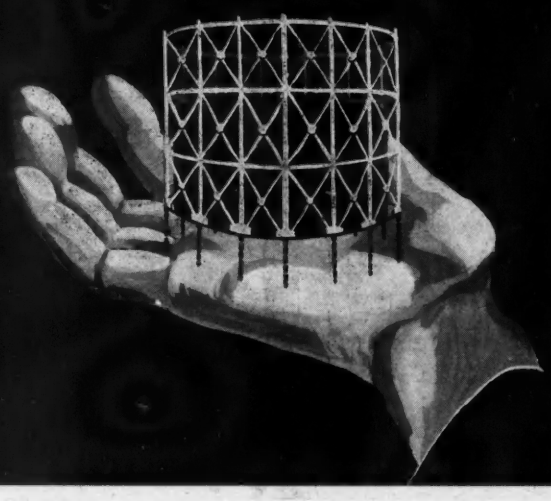
LET US SUPPORT YOUR STRUCTURES ON OUR WELL KNOWN PATENTED SHELL PILES



WEST'S PILING & CONSTRUCTION CO. LTD., BATH RD., HARMONDSWORTH, MIDDX.
London Office: Columbia House, Aldwych, W.C.2.

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